The Postgraduate Experience Project

Good Practice Guide

Developing and acquiring employability skills, competencies and attitudes at postgraduate taught STEM level through collaboration

Edited by Michelle Morgan and Deborah Anderson

This document is a collection of work and ideas from partner institutions involved in PEP and colleagues from higher education and business and industry. It is intended for use in the higher education sector as a guide for what has been done and a pointer to what could be achieved. We hope it will lead to more, successful innovations in this vital field.

Michelle Morgan and Deborah Anderson, April 2016.

"We are approaching a new age of synthesis. Knowledge cannot be merely a degree or a skill... it demands a broader vision, capabilities in critical thinking and logical deduction without which we cannot have constructive progress."

Li Ka-shing
(Chairman, Hutchison Whampoa)
Financial Expert Witness Communication: A Practical Guide to Reporting and Testimony, 2014.

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1. Introduction

This Good Practice Guide has been generated by the Postgraduate Experience Project (PEP), which was one of 20 projects funded through the Higher Education Funding Council for England's (HEFCE) £25million Phase 1 Postgraduate Support Scheme. PEP was the largest consortium funded by HEFCE and comprised 11 universities (nine English [9E Group], one Welsh and one Scottish), which are geographically dispersed across the UK. The collaborative partners included the universities of: Brighton, Coventry, Edinburgh, Kingston, Lincoln, Manchester Metropolitan, Portsmouth, Plymouth, South Wales, Teesside and Wolverhampton. The Welsh and Scottish universities funded themselves as they were not under HEFCE's auspices. Crucially, business and industry leaders and higher educational specialists were also involved.

a. The rationale for PSS Phase 1 Postgraduate Scheme
The UK is facing two major issues regarding postgraduate recruitment. Firstly, although the postgraduate taught market (known as PGT hereafter) expanded dramatically in the UK between the early nineties and 2010, there has been a substantive decline in PGT student numbers (Millward and Creasey, 2013; HESA 2013a,b; Morgan 2013; Morgan, 2014). The decline has been especially notable amongst UK and Overseas domiciled students. The part-time study mode (traditionally dominated by UK domiciled students) and STEM disciplines have been greatly affected. Although intuitive reasons can be made to explain the decrease, including the lack of a viable funding scheme for students to fund their studies (Boorman et al., 2009; UUK, 2013), there is limited evidence to provide accurate explanations enabling the development of practical strategies to reverse this pattern.

Secondly, although extensive research has been undertaken at undergraduate level in the field of the student experience and learning and teaching (e.g. Tinto, 1988; Thomas, 2002; Morgan, 2011), there is limited, although growing, body of research in the area of PGT study (Wakeling, 2005; Stuart et al., 2008; Morgan, 2013). This led to the Higher Education Commission commenting in 2012 that *'postgraduate education is a forgotten part of the sector'* (Higher Education Commission, 2012:17).

The available research tends to concentrate on recording and assessing the PGT experience at the end of the course (e.g. the annual Postgraduate Taught Experience Survey (PTES) by the Higher Education Academy) rather than understanding motivations, expectations and transitions. Although the Higher Education Statistics Agency (HESA) records student data, there is a lack of accurate and detailed retention data available (Millward and Creasey, 2013; Morgan, 2013). The recent changes in higher education, as a result of the White Paper *Students at the Heart of the System* (Department of Business, Innovation and Skills, 2011) along with the falling PGT numbers, has resulted in research into identifying factors impacting on participation and successful progression very pressing. The UK government is committed to expanding PGT study to improve the UK's industrial competitive global position (DTI, 1998) as well as the UK's position in the global market of HE.

Calls by a number of organisations for further research and examination into the future of postgraduate education include the Higher Education Commission, the 1994 Group, the Higher Education Policy Institute, the National Union of Students and the Sutton Trust. It was for these reasons that HEFCE instituted Phase 1 of the Postgraduate Scheme, to test ways to support the progression into postgraduate masters' education in England by working with universities and employers to stimulate the participation of applicants who would not have otherwise progressed to this level of study.

b. The aims and objectives of PEP
The aim of PEP was to explore the neglected areas of knowledge highlighted above by looking at the expectations and attitudes towards PGT science, technology, engineering and mathematics (STEM) study, and post-study outcomes from the perspective of students, universities and employers across a group of institutions diverse in student body and geography. PEP involved a range of stakeholders from different sectors.

The project's overarching aims and objectives were constructed to maximise the sector's knowledge regarding the participation, progression and success of new PGT STEM students across the participating universities and non-institutional stakeholders. It aimed to provide an understanding of issues within each institution and across the 9 English higher education institutions (HEI) as a whole, as well as giving a UK perspective through the participation of the Scottish and Welsh universities. PEP wanted to produce baseline data that would provide immediate insights into applicant and student behaviour, as well as creating a template for other institutions wishing to undertake their own comparative research at a later date. Ultimately, the aim was to undertake practical research to provide practical outcomes that could help sustain the PGT market. The project's main report can be accessed by going to: http://www.postgradexperience.org/project-docs/

The project had multiple aims which are highlighted in Diagram 1 below.

Diagram 1. Aims and objectives of PEP for the different key stakeholders
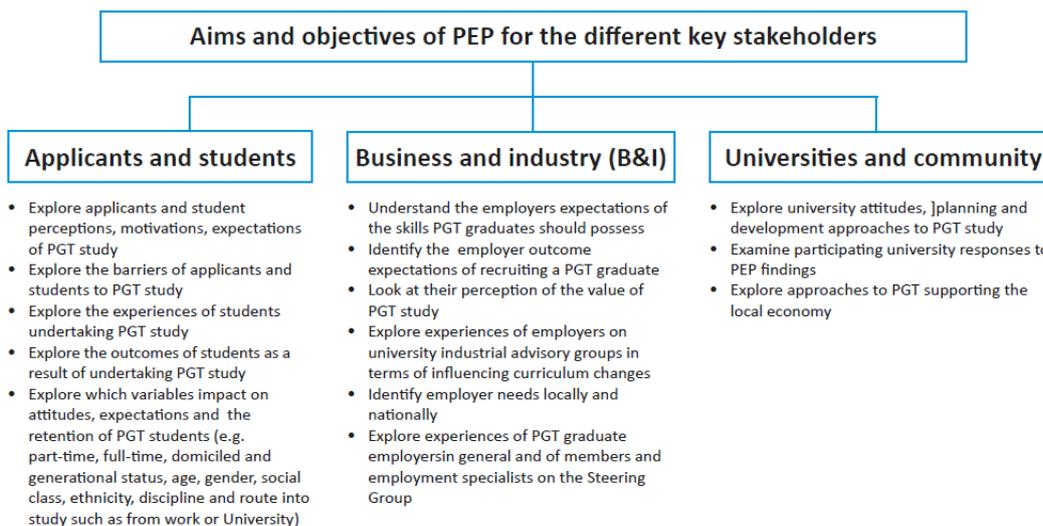
The key outcomes/outputs were to:
• identify any similarities and differences between each institution and student body, and determine what conclusions could be drawn from the research;
• identify any particular issues that appeared to impact successful progression and engagement of PGT students and develop strategies to reduce them;
• provide immediate support and advice to new PGT students at an institutional level regarding their concerns arising out of their findings;
• identify employers' needs, and determine how to incorporate them into curriculum design and development;
• use the findings at a local level within each institution when developing and implementing interventions or activities to manage student expectations and experiences;
• explore and identify how to widen effectively the PGT market in the UK;
• create a repository of sustainable and affordable good practice, to be held on the project website for use by the sector;
• provide a large cross-institution dataset which will enable each university to generate further research, thus enriching the knowledge for the sector in general (e.g. part time, mature, differences in attitudes between students coming straight from work and university, generational, domiciled and gender differences, discipline differences); and
• contribute to the national funding model debate with the research findings, and help determine the importance of different levels of fee support and their sustainability in generating PGT participation.

c. Approach to this document

This document is a compendium of some of the good practice generated by the partner institutions based on the findings, to improve the experience of PGT STEM students. It includes advice on the role of higher education in developing employability skills and industrial competencies, innovative examples across the higher education section of HEIs working effectively with business and industry, and debate about how postgraduate study widens, sustains and delivers the skills required for a future economy. An explanation of each chapter's content is below.

Chapter 2: An example of a self-help advice sheet, generated from the institutional Entry to Study Survey

The majority of the project's data was generated by the Entry to Study survey, which was completed during the orientation/induction period in September 2014 across the 11 partners and was the key contribution of the Universities of Wales and Edinburgh (survey can be found in the appendices document on the Project's website).

Within six weeks of the survey closing, each partner was required to generate a self-help sheet for students to ease their transition into study by addressing their reported concerns and anxieties and providing support, advice and contact numbers where they could obtain help. Chapter 2 provides an example of a self-help sheet which has been used to develop further support aids such as dedicated websites as well as marketing processes and which continues to be used as an advice sheet in many of the universities for incoming postgraduate students across all disciplines.

Chapter 3: Good practice initiatives generated from the Postgraduate Experience Project

As part of the PEP project, each of the nine participating English Universities received £10,000 (and was required to provide a further £5,000 as matched funding) to develop new initiatives, or improve elements of those in existence, to address required changes highlighted by their student data from the Focus Groups and Entry to Study and Finance surveys. Each university was required to hold an institutional dialogical conference where the findings were disseminated and discussed. This in turn fed into practical initiatives to improve the postgraduate experience at their university. Chapter 3 showcases some of the examples implemented or developed to improve a range of aspects across the different transition stages at postgraduate masters' level, with activities spanning the student experience. The initiatives range from the development of an information strategy (e.g. Brighton) to targeted information and website development (e.g. Portsmouth, Teesside) to learning tools for interaction (e.g. Lincoln) to the creation of practical dedicated postgraduate space (e.g. Plymouth). It also includes a funding support initiative from one of the Steering Group's business and industrial advisors that can run alongside any government or banking loan scheme.

Chapter 4: The role of higher education in developing employability skills and industrial competencies

In this chapter, colleagues from the Universities of Cranfield, Kingston and Lincoln provide practical and theoretical advice in developing employability skills and competencies within curricula. The paper from the University of Cranfield reports the discussions, findings and outcomes from an event they organised for those involved in the management, design, delivery and marketing of postgraduate taught courses. The two papers from Kingston University discuss the importance of putting skills back onto the agenda in creative ways, while the University of Lincoln highlights the importance of linking the learning outcomes of postgraduate taught students to industrial competency.

Chapter 5: Working with business and industry to provide flexible courses fit for purpose

Chapter 5 highlights the work of two universities in developing masters' courses in collaboration with business and industry. The paper by the University of Brighton and Surrey County Council on their joint venture to enhance postgraduate education to support the needs of industry, through delivering a closed MSc course for a consortium of local authorities, describes the challenges they faced and the successful outcomes they obtained.

The paper by the University of the West of England (UWE) explains their work on flexible lifelong learning study programmes designed to support both individual career aspirations and organisational development.

Their case study identifies their development of a flexible mechanism which enables both individual career and organisational capability development; a methodology for university and business working together to provide mutual support and benefit for future growth.

d. Conclusion

This report has been written so readers can easily dip in and out of the different themed chapters. Although the initiatives and papers in compendium are for STEM disciplines, they could easily be applicable across other disciplines and other institutions.

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2. An example of a self-help advice sheet generated from the institutional Entry to Study Survey findings

Kingston University London

PEP
Understanding Today to Create Tomorrow

FACULTY OF SCIENCE, ENGINEERING AND COMPUTING

Postgraduate Experience Project Survey Results (PEP)

Understanding the prior learning experiences and learning and teaching expectations of postgraduate Masters' students in the Faculty of Science, Engineering and Computing 2014/15

WHAT YOU SAID

Thank you to everyone who completed the survey during the last month. The aims of the survey are to explore your previous learning and teaching experiences and your expectations of studying at postgraduate masters Level (PGT). The objective is to use the results to develop academic and non-academic support activities within the Faculty and to strengthen your academic skills. Your responses will also raise awareness amongst staff of any concerns and anxieties that you may have and will be used to improve your overall PGT student experience at Kingston University.

The key basic findings are listed below. Where you have expressed a concern, there is an advice box pointing you to where you can get further support and advice. The full report (available early next year for you to read and comment upon) will include analysis on any similarities and differences between subject areas and the demographic variables of students (e.g. age, domiciled status, gender).

Basic findings

This year, 184 new postgraduate science, technology, engineering and mathematics students completed the survey. Your comments reflect those provided by the Faculty's new masters students in previous surveys. This illustrates PGT students share similar worries and concerns and past experiences so do not think that you are alone.

Reasons for undertaking a PG degree

The top 3 reasons you cited for undertaking a postgraduate qualification are: 1) to improve your employment prospects; 2) to develop a more specialist set of skills and knowledge; 3) you were interested in the subject.

> **ADVICE** Improving your career prospects is very important to you. To help you do this effectively, you can get advice and support on careers and employability from the KU Talent team in Room 4, John Galsworthy building. They can be contacted by E: kutalent@kingston.ac.uk; T: 020 8417 7445. Look out for employer events!

Reasons for choosing Kingston to do your PG study

For most of you, the location of the institution, course content followed by the cost of the programme were the most important reasons when choosing your university course.

Fees and funding

For 76% of you, fee levels were a "very important" (43.2%) or "important" (32.8%) factor in your decision making process when deciding where to study. Parents/guardians are helping 31.5% of you fund the course, 30.4% are using savings, 20.7% are using a salary and 16.3% have a loan. You are funding the living costs with a salary (39.1%), with the help from your parents/guardians (34.2%), and using your savings (29.9%).

> **ADVICE** If you are concerned about funding issues you can get advice and support on your fees from Credit Control: 0844 855 2309, E: creditcontrol@kingston.ac.uk. There is also money management advice available from The Student Funds team, at The Students Life Centre (John Galsworthy Building) T: 020 8417 7315, E: studentfunding@kingston.ac.uk
>
> If you have money concerns, you can also contact The Citizens' Advice Bureau, at Kingston CAB service. Address: Neville House 55 Eden Street, Kingston, Surrey, KT1 1BW   T: 020 3166 0953

Expectations

Your expectations of studying at postgraduate level are that you expect to study in a more independent way, you expect value for money and expect to receive more individualised study than you experienced at undergraduate level. You hope that your postgraduate study will provide you with specialist knowledge (51.1%) or widen your knowledge (36.4%).

> **ADVICE** If you are unhappy about any part of your postgraduate experience, talk to your Course Director in the first instance. If you have an academic issue regarding a module, talk to the Module Leader. Most issues can be resolved at the module level. You can also ask your Course Representative (the student who represents the views of the course) to raise any issues at the relevant Faculty Meetings to register your concerns if they are not resolved by your Course Director or Module Leader.
>
> If your concern is about a non-academic issue, contact the Student Support team by emailing secstudentsupport@kingston.ac.uk. You can also contact the Students' Union for advice by calling 020 8417 2974 or by emailing: support@kingston.ac.uk.

Anxiety levels

Starting anything new such as a new course can cause anxiety. Just over 40% of you stated that you were slightly anxious, and 28.4% of you were anxious or very anxious. The main anxieties expressed are not being confident about coping with balancing life demands and study (45%), managing money (34.8), getting involved in university life (31%), coping with the standard of work (30.6%), and managing the travel demands to university (25.2%).

> **ADVICE** Feeling anxious is very normal. Postgraduate students have busy and complex lives so balancing study and life outside of university can be challenging. It is important that you speak to SOMEONE if you are worried so that you can be supported effectively. This can include your Module Leader, Course Director and the Student Support Team within the Faculty or the Students' Union and other University central support services. Most issues can be effectively addressed if done promptly. There are other support numbers listed at the end of this leaflet.

Understanding what is meant by the term 'Feedback'

You understand what is meant by the term feedback in relation to your academic work.

> **ADVICE** Throughout your studies, you will be asked for feedback in a range of areas including modules and surveys like this one you completed. It is essential that we provide you with a satisfactory response to your comments. This approach is embedded in the University's Led by Learning policy and the Partnership Agreement. If you do not feel that you have had adequate academic feedback, please raise the issue with the appropriate person.

Feedback preferences

The most popular preferences for feedback are written (hard copy), email and individual face to face with tutor.

> **ADVICE** As a postgraduate student, you will be exposed to different learning styles and expected to study in a more independent way. Learning at postgraduate level is different to studying at undergraduate level. If there is anything about your feedback that you do not understand, it is important that you ask your Module Leader or Course Director. You should use the feedback, advice and guidance to help you with future assignments. If you do not know what you did right or where you went wrong, you cannot take this into account when undertaking your next assignment.

Academic strengths and weaknesses

Many of you state that you feel you have very strong, strong or adequate academic strengths. However, quite a few of you are concerned about some of your study skills with 15.2% of you feeling that you have a weak knowledge of the subject you will be studying on your PGT course. This is quite common, so do not panic!

> **ADVICE** Your academic skill base will be shaped by where you have previously studied and your previous learning experiences. Every student is different and you will have your own preference to how your study. However, it is important to engage with the different learning approaches on your course. If you are concerned about any of your academic skills, there is help available so DON'T PANIC! If you feel you need extra support, the SEC Academic Success Centre (SASC) (sasc@kingston.ac.uk) is available for all levels of students enrolled on courses within the Faculty of Science, Engineering and Computing. A group of trained staff and students are available to help you with your academic skills such as report writing, presentations, note taking, time management, exam revision, referencing and mathematical skills. The centre provides assistance and advice on draft assignments prior to hand-in.

> **ADVICE** Create your own Study Group
> As a postgraduate student, studying alone outside of class can be challenging, especially if you do not understand something. It can be helpful to create a 'Study Group' of fellow students on your course who you can contact outside of the classroom. A Study Group can be a very supportive learning tool, especially if it contains fellow students who have different academic skills. You support one another in your studies.

Value of a postgraduate qualification

As a cohort (75.5%), you feel that employers do value a postgraduate masters' qualification more than an undergraduate one and you strongly agree that a PGT qualification will provide you with practical experience in the subject area (47.8%), better prepare you for future employment (45.4%) and improve your employment prospects (50.8%).

> **ADVICE** This is true, but it is important that you harness all your skills when applying for a job after your postgraduate degree. You must remember that employers do not necessarily see a postgraduate qualification as an indicator of leadership potential or work wisdom and these are two of the key skills employers are looking for in masters and doctorate graduates. The KU Talent team can help you produce a CV and applications that will be of interest to employers, so do contact them! Website: http://www.kingston.ac.uk/careers/

DEMOGRAPHICS

This year, 17.4 % of the sample has come straight from study and training, 10.9% from study and working, 42.4% from full-time paid work, 9.8% from part-time paid work, 7.1% were previously unemployed, and 12.5% were in other situations.

Gender

The gender split for those participating in the survey is 58.7% male and 41.3% female.

Ethnicity

You classified yourselves as 42.9% 'White', 22.2% 'Asian', 15.1% 'Black', 4.8% as 'Mixed' and 14.7% as 'Other'.

Domiciled status

You said that 65.2% of you reside in the United Kingdom, 9.8% in the European Union (EU) and 25% Outside the EU. This reflects the overall Kingston University SEC PGT statistics for 2014/2015 where 66.6% of PGT students are recorded as being UK domiciled.

> **ADVICE** If you are an International student you can contact the International Advisory Centre for specific help, advice and guidance on T: 020 8417 3645, E: isac@kingston.ac.uk

Age

Of the sample, 44% are 25 years old or below, 28.3% are between 26 and 30 years old, 12.5% are between 31-35 years old, and 15.2% are 36 or older.

> **ADVICE** As a mature student, studying alone outside of class can be challenging especially if you do not understand something. It can be helpful to create a 'Study Group' of fellow students on your course who you can contact outside of the classroom.

First language

Of the survey sample, 48.1% of you stated that English is your first language. Of the remaining 51.9% for whom it is your second language, 45 different languages were reported! This illustrates the diverse environment in which you are studying. Of the UK domiciled students, 37.5% have English as a second language.

> **ADVICE** If English is not your first language, you can get support from the English Language Development Department. They run classes that are free. They can be contacted by emailing els@kingston.ac.uk

If you need support and guidance, there are a range of other services at the University you can use. These are listed below.

> **ADVICE Other useful support numbers**
> Faith and Spirituality T: 020 8417 2940 E: faith@kingston.ac.uk
> Disability and mental health advisers T: 020 8417 7314 E: disability@kingston.ac.uk
> Dyslexia Support T: 020 8417 7314 E: disability@kingston.ac.uk
> Health and Wellbeing T: 020 8417 2172, E: health@kingston.ac.uk
> GP Fairhill Medical Practice T: 020 8417 2204
> Nightline (confidential support service) T: 020 7631 0101 E: listening@nightline.org.uk
> University Switchboard T: 020 8417 9000

Produced and Edited by Ines Direito, Lead Researcher, the Postgraduate Experience Project and Faculty of Science, Engineering and Computing, November 2014

3. Good practice initiatives generated from the Postgraduate Experience Project

a. Behaviour modification training: A video resource for practitioners in MSc Clinical Animal Behaviour
University of Lincoln

Why and how it was developed, what it included and how it was implemented

The aim was to provide AV resources assisting students on the course, detailing techniques when practice is not possible. As future practitioners in the field of Clinical Animal Behaviour, students need to understand how to perform a range of behaviour modification techniques. In addition, they need to be able to explain this to owners of pets with problem behaviour. There is no time during the course to cover all of these techniques in detail, and in practice it is not always possible (due to a range of constraints) to demonstrate essential procedures with a patient. There were no suitable audio visual resources to take the place of live practice for our students both during their studies and after they graduate. This initiative would fill this need. The target group were students on the MSc Clinical Animal Behaviour.

A range of useful behaviours were identified by the team running the Animal Behaviour Referral Clinic. The list was passed to a previous student with her own business that still worked with the University of Lincoln who had the resources to undertake this work using the methodologies as taught on the MSc Clinical Animal Behaviour course.

In conjunction with the clinic team, story boards for the behaviours were developed and the training behaviours filmed. PDF documents were also written describing the training protocols in detail. The final material was edited by the clinic team and written to DVD. Examples of the behaviours included:
1) Mat training
2) Loose lead walking
3) Hand touch
4) Watch me
5) Self-control exercises
6) Self settle
7) Give
8) Leave
9) Recall
10) Say hello / Say goodbye
11) Desensitisation and Counterconditioning around dogs.

The cost for the development and first set of DVDs was £3000. The DVDs were distributed to the existing cohort as soon as they were completed. In the future, new cohorts will be given the DVDs during induction week. New cohorts will be asked to complete a short survey regarding the usefulness of the resource, how they have experienced its benefits and how they perceive that it may benefit them once they are in practice. In addition, they will be surveyed regarding additional material and information they would recommend we include in any future iterations of the resource, which we may be able to develop in future. The aim is to prepare students when they leave us to feel better equipped to implement and teach these techniques in their future careers.

The material could be put on the clinic website for use by clients (via a link emailed to them) or potentially made freely available as an open resource to the wider public via our website. A decision regarding whether or not we make use of these options has not yet been made. At the very least it will be used as a resource by the clinic team during consultations.

Contact details: Helen Zulch hzulch@lincoln.ac.uk

b. Case studies of sustainable good practice to support masters' applicants and students
Teesside University

Why and how it was developed, what it included and how it was implemented
The PEP project enabled Teesside to develop a small number of good practice initiatives to support the PGT experience. This section includes a brief description of these and outlines our aims for continuing the activities. The case studies focus on three areas: skills to succeed with studies; future employment in light of student outcomes; and building learning communities. Longer term outcomes described below also involve staff development for lecturers and support staff working with PGTs.

Employability package
Working in conjunction with the Careers Service, we are developing a set of activities and materials MSc students can access to develop their employability skills and evidence their learning for employment. It was clear from the data collected that employment was a very important priority for STEM PGT students, and from the wider research project which highlighted that many employers did not see MSc's per se as essential for entry into a job. It is clear that in the longer term we will need to continue to explore a range of activities and approaches to help PGT students into relevant employment. We explored aligning an employability package with applications for the hardship fund to provide enhanced opportunities for disadvantaged students to increase their future opportunities. However, this proved too difficult to organise in the timeframe and we had a relatively small number of applicants for the first call out of the hardship fund, making any activities non- viable. This may be something that could be considered in the future, or at other institutions with a larger PGT intake.

The final approach taken for the employability support to ensure its sustainability has been to incorporate this into the MSc website (see below), and we are working with the Careers Service to build elements of the site specifically to support MSc employability. We are hoping to use some of the contacts established through the PEP project events to enable us to include podcasts from relevant employers and employment bodies within this resource.

Skills workshops
Two workshops for PGTs are now being provided on 'analysing data and managing numbers'; and 'writing up MSc dissertations or projects'. These deal with areas identified by both students and staff teaching STEM MSc students. Some project tutors had highlighted the challenge of providing individual support to students who were having difficulties with these two areas of the programme. In the long term, we envisage workshop support focussing on this as adding an extra layer for PGT students, and making guidance and support less dependent on the individual project tutor. These workshops were initially partially funded through the PEP project as a pilot. It is expected that the initial development material, resources, and the learning provided from running these two skills workshops as a pilot, will be used in the future through PGT workshops provided centrally via the University's Succeed@Tees scheme.

A number of students who were unable to attend the relevant workshop contacted Teesside's PEP Key Link about individual support for statistical analysis, suggesting that this is an area which causes some anxiety for students. Teesside has a 'Learning Hub' in the Library and Resource Centre which provides drop in support, and we hope to liaise with the head of the Learning Hub in the future to explore further support for this area of PGT study.

Building on these initial plans for an MSc student group (run by students)
We are developing a website with links to relevant resources, including employability materials (see package above) and skills guidance developed from workshops provided for this year's cohort. The aim is to provide links to a variety of online resources suitable for STEM MSc students, although it is envisaged that this will be extended to other disciplines. This will be sustainable through the ongoing work around PGT support taking place in the Students' Union (SU), participation of interested Institutional Working Group (IWG) members, the support of volunteer programme leaders and the Careers Service, who are currently maintaining the careers site.

MSc Support website and both real and online PGT spaces
Early in the project we explored the development of an MSc support group with the Student's Union and members of the IWG. There was some interest in this group, but it proved difficult to get enough participation in the early stages of the year.

However, it is envisaged that this website may reinvigorate interest in the MSc support group, and in the future this group may be revisited by the SU and interested parties. The University is currently committed to creating a PGT room at the top of the Library as part of a set of building and refurbishment work. The PEP project has been able to support aspects of this and to provide further impetus for the value of such a space. The physical space, as well as the online space, will provide further support for building a PGT learning community across the institution and raise the visibility of PGT students, as well as promoting opportunities for PGT study to undergraduates and visitors.

Staff development workshops and guidance materials for PGT programme and module leaders
Findings from the project and from the learning gained from the support initiatives are being drawn on in the development of materials and workshops ready for the start of the next academic year.

General reflections on the case studies and their development
It is challenging to get student participation in activities and events which are not directly part of their course. Many students had expressed an interest in getting involved, but then found it difficult to make the time for extra activities. This is not surprising given the challenges facing students today in balancing work, study and life demands. This was one of the reasons we decided to develop the website, and to integrate some of the other support developments into the site. All of the initiatives are designed to benefit current MSc students, but some elements will be incorporated particularly to support those who are part-time continuing next year as well as future PGT students. The aim is for all of the initiatives above to be designed to be sustainable and integrated into normal activity.

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c. Online skill support for masters' applicants and students
Manchester Metropolitan University

Why and how it was developed, what it included and how it was implemented

The PEP project has been instrumental in informing and re-directing the debate on how Manchester Metropolitan University (MMU) ensures it provides students value for money in their studies and enables them to become world class professionals. The most significant dimension to the sustainable development as a result of the PEP project work will be the online platform designed to provide students with an opportunity to reflect on the skills they have and need to develop, appropriate opportunities to develop these skills, and information and inspiration from MMU alumni.

A very prominent theme emerging from the research were the many non-academic challenges our students face and have to navigate during their postgraduate studies. Undertaking a masters course for many students involves realising a balance between a series of complex and competing demands in terms of earning and learning, and the time and money required to do both successfully. A key insight was that students were willing to endure the risk and costs of post-graduate study on the basis that it increased their employability or developed their career.

After looking at good practice already in existence, the MMU research team focused on developing a sustainable yet individualised and dynamic online resource that can help postgraduates reflect on the hard and soft skills and experience they have, the skills and experiences required to enter particular jobs, and identify ways of developing these through opportunities at MMU.

Aim

The online resource will provide postgraduate students with the understanding, knowledge and opportunities to invest in their future while studying at MMU to give them the best possible chance of securing a world-class professional job in the STEM sector.

Objectives

1. Create an integrated online resource that enables students to reflect on their skills and experience, identify what skills and experience are required to enter particular career pathways, and identify what training or other opportunities will help them advance.
2. Link the resource to on-going activities and opportunities for knowledge, skills and experience development run through MMU or partner organisations.
3. Implement a pilot test of the online resource in one school, Science and the Environment, and evaluate the initiative with the aim of rolling out the use of the site to other schools in Science and Engineering.

The platform will comprise 3 components (Self-reflection tool, Connect and Alumni), with interrelated user pathways enabling the student to initiate their journey from any point. They will be directed and able to navigate the site's different components to create an individualised user experience.

Self-reflection tool

A key aspect of the online support site is that it should provoke the student to reflect on their current hard and soft skills, knowledge and experience and consider these in relation to the types of skills they need to develop to enter particular career pathways. The Self-reflection tool will comprise of a series of questions for the student to consider. The questions will be organised in a delineated series of domains that the student will be able to answer individually, if they wish to develop a particular area such as presentation skills, or to take the survey all at once. Each domain will contain a series of questions and ask the student to consider how confident they are that they can, for example, deliver a professional presentation to a group of knowledgeable individuals. Once they have answered these questions they will be able to review careers options (see the 'Alumni' section below), to gain an understanding of whether they have the skills and level of proficiency to succeed in that particular career.

Connect

The 'Connect' part of the website will provide an easy to navigate interface of the numerous and diverse opportunities to develop particular knowledge, skills and experience. For example, there are a number of sites and services in the university and nationally that provide students with information on volunteering services or industrial placements. The intention is not to duplicate the content and functionality of these, but rather to create a series of pathways that frame opportunities in relation to the process of self-reflection and the identification of particular domains and types of skills, knowledge and experience the student is seeking to develop to pursue a specific career pathway. The 'Connect' section will be populated by an extensive review of the opportunities for career development that are available at MMU, its partner organisations and national websites and services.

Alumni

The alumni gallery will be populated with people that once studied at MMU and now have successful careers in the STEM sector. Each individual will be interviewed and asked a series of questions about how they developed their careers, in terms of placements, work experience, publications and other relevant factors. In addition, alumni will be asked to reflect on the skills, experience and knowledge that were instrumental in enabling them to enter and progress in their career. These significant skills, experience and knowledge will be mapped onto the domains in the 'Self-reflection tool'. These factors will be represented in a visually distinctive way that quickly allows the user to comprehend a career pathway and understand how these characteristics might relate to themselves, their assessment of their current position, and the opportunities available to them through the 'Connect' section of the website.

An identified challenge for this section of the website will be encouraging alumni to participate, interviewing them and taking quality photographs and video. To engage with this issue, the project is hosting a celebration event for MMU alumni, providing the opportunity to gather individuals together and take photographs and videos.

A key component of the website's success will be encouraging students to use the site. In order to do this, we are developing a multi-strand approach to student engagement and community development. The first step will be to ensure that the site functions in the way that is useful for students, with an effective integration of the three components of the website.

It will be crucial that the 'Connect' section includes signposts to a range of appropriate opportunities for students to develop their skills, which will be achieved through a comprehensive review and organisation of existing postgraduate opportunities. A second strand of user engagement will be developing and distributing appropriate marketing materials (e.g., fliers and posters) and publicising the site on MMU student sites and social media channels (e.g., @mmu_scieng). Thirdly, we will work to incorporate the website within teaching and career practice discussions by asking lecturers and employability guidance staff to refer students to the site.

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d. Contact strategy
University of Brighton

Why and how it was developed, what it included and how it was implemented

The findings of Brighton respondents from the Entry to Study survey and focus groups identified that students had a number of concerns and issues. It was recognised that a Contact Strategy would help provide targeted information effectively. The initiative was aimed at all postgraduate taught students.

As part of the PEP Project, an advice note (See self-help sheet in Chapter 2) generated from the Entry to Study survey findings was disseminated via email to STEM MSc students in November 2014. It provided feedback to students on aspects of the Entry to Study survey many of them had completed, together with signposting to appropriate University resources. It was organised under four headings: Your Studies; Your Money; Your Student Life; and Your Careers. It was disseminated as an email with clickable links using the software dotMailer. The benefit of using dotMailer is that it automatically formats the email for the device used to read it, be it computer, tablet or smart phone. The advice note is seen as a model for contacting students about a range of issues in the future.

The University is continually developing a Contact Strategy for postgraduate taught students that will be informed by the findings of the PEP study. In particular, it will include a revised form of the advice note. The first version of the Contact Strategy will be in place for the start of as academic year 2015.

The cost and activity will be integrated into existing services and programmes, and it will be continually reviewed and updated. To enable the university to target information and help applicants and students access commonly sought information easily. It is hoped that this will help improve their experience whilst at university and enable them to succeed in their studies.

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e. Initiatives in development
University of Brighton

Why and how it was developed, what it included and how it was implemented

The PEP findings identified a number of issues relating to transitions into study, international students, learning and teaching and employability. As a result, a number of initiatives for postgraduate students have started to be developed. Those involved in the four different initiatives include:

1. Academic Study Kit (ASK) PGT -The Centre for Learning and Teaching (CLT)
2. Employability and Employment - Careers/Employability
3. Transitions into postgraduate study - Strategic Planning and Projects Office, Student Services, Marketing and Communications and other key stakeholders
4. International students - Strategic Planning and Projects Office (SPPO) and Marketing and Communications.

Academic Study Kit (ASK) PGT

The Entry to Study survey highlighted that more than half of the students surveyed were concerned about studying at postgraduate level, a higher proportion at the University of Brighton than at other universities in the study, and many were concerned about their ability to study independently. The Centre for Learning and Teaching (CLT) at the University has developed an Academic Study Kit (ASK) as a series of related resources available on the University website. It is currently largely targeted at undergraduates, but it now has some PG content and more is being developed as a result of the findings.

The Strategic Planning and Projects Office (SPPO, responsible for the delivery of the PEP Project at the University) is working with CLT to agree further developments and updates of the PGT-related resources in ASK to make it more relevant and attractive to postgraduate masters' students. This will also include an awareness-raising campaign. In addition, a small number of PG ASK student ambassadors will be recruited to complement the campaign and help raise awareness of the support available using a peer support model. A resource pack to train future ambassadors will be developed so that the model is sustainable.

Employability, Employment and Employer Engagement

The Entry to Study survey showed that students had high expectations about the job they would move into on completing their course. Of respondents from Brighton, 46% expected to be able to enter a specialist role as a result of their new qualification. Of Brighton students, 76% expected to find a job appropriate to their level of skills and knowledge. In both cases this was higher than average across the study.

The survey also showed that most students expected their course to provide them with relevant skills and improve their employability. Therefore, employability will be one of the key issues addressed in the Contact Strategy for postgraduate students (see previous case study).

In addition, the University will support the development of new web-based PGT-specific careers and employability resources. This will involve a review of existing materials, a re-write pitched at the appropriate level and production of new web content. It is planned that this will be developed and delivered by spring 2016.

A limited fund is to be established to support wider employer engagement in the development and delivery of future PGT programmes to increase the relevance of postgraduate provision to regional employers.

Transitions into postgraduate study

Both the Entry to Study survey and the focus groups highlighted concerns and difficulties that students experienced in transitioning to postgraduate study. There appeared to be particularly acute problems for international students.

SPPO is working with Student Services, Marketing and Communications and others to improve, extend and target the information provided to postgraduate taught students in their first few weeks at the University.

We are also reconsidering how this information is delivered, including consideration of the production of appropriate video clips and of extending the University's Welcome Week to postgraduate students, which is currently only targeted at undergraduates.

For international students, we are looking at ways of improving their orientation (also known as induction), including ensuring they are aware of the opportunities of socialising with and learning from other students from similar backgrounds.

International students

In the Entry to Study survey, the University of Brighton had a higher proportion of respondents who did not feel they were fluent in English (18%) in the survey sample than the average for the study (9%), and a high proportion of international students expressed concerns about getting used to living in a new country.

In the focus groups, international students in particular noted difficulties in adapting to a change of academic regime.

The Extended Masters programme (EMA) model which provides integrated English Language support to students who meet the academic entry requirements, but require additional English Language support as part of their programme of study, will be extended more broadly across the institution in response to student feedback.

Website

The PEP Project has identified a number of areas where postgraduates felt they lacked information and advice. In some cases, this information was available, but not easy enough to access. SPPO is working with the Marketing and Communications Department to develop the University's Website, using the results of the PEP Project to help to prioritise the inclusion and display of resources specifically for postgraduate taught students.

The PEP Project has provided findings which allow the University to prioritise improvements in its offer to postgraduate taught students. Some of these improvements will take time to develop, and will be made effective by integrating them into existing services and programmes. By targeting these various areas, it is hoped that our postgraduate taught students will receive a holistic and high quality experience at the University.

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f. Online postgraduate guide
Portsmouth University

Why and how it was developed, what it included and how it was implemented
The PEP project identified that Portsmouth students wanted more advice and support on entry, and during their studies. It was decided to enhance an existing webpage called PrepUP (Preparation – University of Portsmouth) to further support our postgraduate students. It can be found by going to:
http://prepup.port.ac.uk/

PrepUP has been designed to provide students with information (generic and personalised) that will help them prepare in advance for their first few weeks at the University, including information about their course, about their learning environment at the University, and about studying in higher education. They can also start to socialise with other students by joining the Facebook groups mentioned on the PrepUP site; watch videos where tutors provide hints and tips and where students talk about their experiences; and take part in competitions. PrepUP has been developed in Moodle, which is a version of the University's Virtual Learning Environment (VLE) aimed at helping students get used to VLE before they arrive and start their course.

An extra tool was created to target postgraduate students. An online postgraduate guide similar to the self-help sheet (see Chapter 2) was developed from the findings of the overall research. The online postgraduate guide entitled: 'Advice for Postgraduate Students - Survey Results and Student Support' was made available as part of a webpage that exists already in the University of Portsmouth online resources.

The PrepUP home page comprises the following tabs/sections: 'My Course'; 'Uni Learning'; 'Uni Life'; 'Competitions'; and 'Facebook'. When someone enters the 'Uni Learning' section they will be able to see the tab entitled 'Advice for Postgraduate Students - Survey Results and Student Support' which refers to the PEP research findings. The contents of this section contain a variety of articles which cover:
- some of the findings of the PEP research related to students' characteristics, behaviour, expectations, and experiences; and
- advice and guidance as to how students can get the support they may need from the University of Portsmouth or elsewhere.

Figures 1-4 show some of the various subsections of this online postgraduate guide.

Figure 1   Front page of PrepUp

Figure 2   Example of advice

Home ▾   Useful Sites ▾   Help Sites ▾   PrepUP Generic Staff Account ▾

PrepUP 2015

My home / My Sites / PrepUP / PrepUP2015 / Advice for Postgraduate Students

Advice for Postgraduate Students

Anxiety levels

Starting anything new such as a new course can cause anxiety. Over 74% of the students stated that they were anxious about starting their course.

ADVICE Feeling anxious is very normal. Postgraduate students have busy and complex lives, so balancing study and life outside university can be challenging. It is important that you speak to SOMEONE if you are worried so that you can be effectively supported. This can include your Personal Tutor, Unit Co-ordinator, Course Leader, the student support teams within your faculty, the Students' Union, and other University Student Advice Services. Most issues can be effectively addressed if done promptly.

If you are struggling with academic skills, contact your faculty's Learning Support Tutor or the Academic Skills Unit (ASK) at the Nuffield Centre. For more information about one-to-one tutorials, a variety of resources, and skills sessions, you can visit http://www.port.ac.uk/ask or check Skills@portsmouth on Moodle *(remove as students wont have access?),* moodle.port.ac.uk

T: +44 (0)23 9284 3028,
E: academicskills@port.ac.uk

If your concern is about a non-academic issue, you can contact any of the following services (or the services listed at the end of this document) depending on your needs: Student Wellbeing Service (Counselling and Mental Health), the Nuffield Centre, St Michael's Road, Portsmouth PO1 2ED.

PrepUP Feedback Survey

YOUR FEEDBACK

Take part in the PrepUP Feedback Student Survey.

Figure 3   Fees and funding page

Home ▾   Useful Sites ▾   Help Sites ▾   PrepUP Generic Staff Account ▾

PrepUP 2015

My home / My Sites / PrepUP / PrepUP2015 / Advice for Postgraduate Students

Advice for Postgraduate Students

Fees and funding

For 80% of you, fee levels were an important or very important factor in your decision making process when deciding where to study. Parents are helping 35% of you fund the course, 23% are using savings, 18% are using a salary or personal income, and 14% are taking out a loan.

ADVICE If you are concerned about funding issues you can get advice and support on your fees from the Student Finance Centre at the Nuffield Centre:

T: +44 (0) 2392 843014,
E: student.finance@port.ac.uk.

You will find more information, advice and guidance on student funding, hardship funds, and managing your money at: http://www.port.ac.uk/money

LOVE YOUR MONEY

PrepUP Feedback Survey

Figure 4   Motivations for undertaking postgraduate study

Home ▾   Useful Sites ▾   Help Sites ▾   PrepUP Generic Staff Account ▾

PrepUP 2015

My home / My Sites / PrepUP / PrepUP2015 / Advice for Postgraduate Students

Advice for Postgraduate Students

Reasons for undertaking a PG degree

The top 3 reasons you cited for undertaking a postgraduate qualification were: 1) to improve your employment prospects; 2) that you were interested in the subject area; 3) to develop a more specialised set of skills and knowledge.

Career Development
- Improve CV
- Stand out
- Develop specialist knowledge and skills
- Develop applied knowledge in practical contexts
- Open new employment opportunities

Education for its own sake
- Interested in the subject
- Enjoying experience in academia
- Natural step
- Explore personal potential
- Sticking to strenghts

Figure Instrumental and non-instrumental reasons for undertaking an MSc

PrepUP Feedback Survey

YOUR FEEDBACK

PrepUP has proved on the whole to be a useful tool provided by the University of Portsmouth that prepares prospective students prior to the beginning of their course, and encourages their participation and successful progression onto higher education (undergraduate and postgraduate study). The online postgraduate guide which was created with the help of the PEP research findings is and will continue to be a helpful addition to the website, which will hopefully make postgraduate students realise that their feelings of anxiety, their expectations, their hopes and fears, their ambitions and challenges that they face are really quite normal among prospective and current students. They will hopefully feel that they are not alone in their journey through higher education, particularly when they realise that there are other students in a similar, if not exactly the same, situation. It is hoped they will also feel that there is plenty of support available at the University, provided by its services, resources, and members of staff.

It is worth mentioning that following the National Dialogical Conference at Kingston in July 2015, and through the sharing of ideas between universities, the University of Portsmouth decided to follow the example of the practical initiative in place at Plymouth University and print self-help cards with useful information and advice for students.

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g. PEP postgraduate support card
Plymouth University

Why and how it was developed, what it included and how it was implemented

During the PEP project's focus groups, some students stated that they were not aware of some support services available at Plymouth and they could have benefited from them earlier on in their studies.

The aim was to provide key contact information for support services in a simple, portable and laminated 'credit card' format for wallets/purses to all incoming STEM postgraduate students and future cohorts.
It was developed by the PEP team at Plymouth in terms of content then designed and printed through the University's design centre. The cards were distributed at Vice-Chancellor's Teaching and Learning Conference (Plymouth's Dialogical Conference activity) in June and were given out at the induction event of new postgraduate students in 2015/16.

The cost was £190 for the design and £266.36 plus VAT for a print run of 500 in the first instance.
The content for the card came partly from the earlier self-help sheet (see Chapter 2) developed for the students in December 2014 after analysing the Entry to Study survey. It was updated during May when a new service support was added and another was taken off as it no longer was in service. Some of the phone numbers also were updated. The content for the card was then sent to designers in late May who gave possible images for the front of the card and ideas for the presentation of the text. The final product was sent to be printed early June. It is hoped that the cards will have an impact beyond the next academic year, but if services change or their contact details then a new run will be needed.

Feedback about the cards from the conference was very positive from the STEM postgraduate students present, the students' union education representative and fellow PEP Key Links. STEM programme leads will be asked to report back any student feedback to the project leads. The researcher will contact all Scholarship students to get their evaluation of the card once they have received one.

The aim of the card is to achieve better awareness, less confusion and anxiety and easier access to student support services by STEM postgraduate students at Plymouth University in an inexpensive way. The card is appropriate for all postgraduate students, both taught and research. It was important to check that all cards are of good quality before distributing as a few were found with indistinct print which had not been discarded by the printers.

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h. Sport science laboratory protocol videos
University of Lincoln

Why and how it was developed, what it included and how it was implemented
Given the limited amount of time that PGT students are often able to spend on campus outside of scheduled sessions, it is important to maximise the learning benefit during those sessions. This is especially true for practical data collection that can only be undertaken within a laboratory setting. The initiative developed was sport science laboratory protocols.

The provision of a series of videos demonstrating correct practice in using physiological and biomechanical testing equipment will have many benefits for the students. Videos can be watched ahead of the first session as preparation, they can be viewed after in-person demonstrations to help reinforce the learning and provide clarification, and as a resource to support subsequent independent use of the equipment by students.

It was also anticipated that student confidence in using the testing equipment would be improved and that they could obtain the required level of competence more rapidly and with greater independence.
The same AV equipment can be used by students to record themselves using the laboratory protocols, as well as in other programme activities such as student-led workshops and debates. The resultant videos will be a valuable resource for informing student reflection and, with relevant student permission, for discussion with future cohorts.

The main activity centred on purchasing some AV equipment for use by staff and students associated with the MSc Sport Science. Poor audio quality is a particular issue with the cameras typically found in a sport science setting, so flexible, high-quality options were included in this area.
The equipment purchased included:
- Panasonic Lumix DMC GH4 Digital Camera
- Panasonic Lumix G X Vario 12-35mm f/2.8 Asph. Lens
- Velbon DF-61 Heavy Duty Aluminium Photo/Video Tripod
- RØDE VideoMic Pro Compact Directional On Camera Microphone
- Blue Microphones Yeti USB Microphone.

Staff will be given instruction on the equipment's use by the College's media content developers who in turn will provide the same guidance to the students, with media developer support where necessary.
The total cost was £1929.90. The AV equipment will be held by the Programme Leader who will make it available to the programme's staff and students, as required. Potential uses for the equipment will be discussed with the students, and feedback will be gathered from students concerning the usefulness of the videos themselves and the process of their production.

At the start of laboratory-based modules, students will be provided with a DVD containing relevant instructional videos. Feedback will be requested from students after use and refinements made for later cohorts, if needed. The library of available resources should increase each year.

Students will be encouraged to record their own videos of laboratory and other programme activities. These will be of immediate use for student reflection and, with relevant permission, may be used with later cohorts to stimulate discussion.

While the main focus of this initiative is laboratory equipment use, the same benefits for supporting the student learning experience would be expected in almost any discipline. The flexibility of the equipment and the freedom for students to explore their own ideas means that the project is not limited to the initial staff plans.

Whilst the production of AV resources of this kind is not novel in itself and many technologies such as smartphones can be used, we feel that the key features for maximising the benefits from this initiative are:

- the high-quality of the recordings; and
- the ability for this equipment to be used by programme staff and students, rather than being reliant on external experts. This enables rapid and flexible response to student needs.

Students will be encouraged to make further use of the equipment for programme-related activities, and the nature of the equipment means that they will be able to produce videos for all quality levels from social media to professional.

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i. STEM postgraduate social space Initiative
Plymouth University

Why and how it was developed, what it included and how it was implemented
During the PEP project's focus groups, a number of references were made to the lack of social space available for STEM students where they could relax quietly with other postgraduate students for a chat with a cup of tea. There is a lack of such dedicated PGT social space across the University and STEM students are spread out across many buildings. During the focus groups, students expressed a desire for a communal space. The target group was all STEM postgraduate students. Two possible sites for refurbishment were identified. Discussions with estate staff took place to choose one venue. Architecture students were involved in designing the site.

Old   **New**

The cost was approximately £10,000 and it took around 6 months to identify the space and undertake the renewal. It was monitored by estate staff. We hope that the outcome will be more contented and satisfied STEM postgraduate students at Plymouth University, evidenced by student responses in the Higher Education Academy's Postgraduate Taught Experience Survey (PTES). The space will also be used for meetings with the Students' Union in helping improve the postgraduate student experience.

The space is appropriate for all STEM postgraduate students, both taught and research. Postgraduates from other disciplines have also been invited into the space, thus creating greater interaction between the different disciplines.

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j. Tablets for the interactive classroom
University of Lincoln

Why and how it was developed, what it included and how it was implemented

It was decided to purchase Android tablets to use with MSc Biotechnology students so that the course could be tailored to use more interactive assets. The hope was that this activity would improve the learning and teaching experience of postgraduate students.

The rationale was that if all the students within a class had a tablet, the lecturer could make use of interactive elements during lectures (papers, videos or other resources online) linked to the already-existing e-learning environment or to quick response (QR) codes in PowerPoint slides and posters. Tablets with reference manager software, such as Mendeley, could provide a valid alternative to printed papers, which are a particularly important resource for research-intensive courses such the MSc Biotechnology. The initiative consisted of:

1. Identification of a suitable and cost effective model of tablet.
2. Purchase of 20 tablets that would be given to students for their use for the duration of the course.
3. Initialisation and encryption of the tablets performed by ICT department to adhere to internal regulations about data storage.
4. Inclusion of suitable interactive material in the course lectures.
5. The latter is still ongoing, although several elements were present already in the course, but not every student had access to them.

The initiative cost was £3,052.32 (of which £52.32 came from the School budget) and started on 31st March 2015. It will end with obsolescence of the tablets.

Students were asked for feedback on resources requested by the University subject boards. It was important to monitor their satisfaction with regards to reading papers in this way, as in the past it was found that their printing credit was largely insufficient for the amount of material they tended to read (this emerged in the PEP focus groups as well). Verification of whether the availability of tablets mitigated this problem was an aim.

The outcome has been an increase in the variety and availability of material provided during lectures, with easy accessibility encouraging further consultation beyond the classroom. It also improved the management of the scientific literature relevant to the subject to students. The initiative seems to be suitable for groups other than the MSc Biotechnology students, but has not been implemented outside this group yet.

For an overview of the approach and further background information, please read: Luisa Sevillano-García, M., Vázquez-Cano, E. (2015) The impact of digital mobile devices in higher education, *Educational Technology and Society* 18 (1), 106-118.

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k. 2014 Masters loans pilot
StudentFunder Ltd

Why and how it was developed, what it included and how it was implemented
The Professional and Career Development Loan offered by banks have not sufficiently satisfied the demand for commercial finance for masters' and professional courses. They fund less than 10% of those who undertake this level of study. Access to funding has been shown to be a major factor preventing individuals participating at postgraduate study level.

StudentFunder was set up to provide an alternative. The 2014 pilot proved the viability of providing alternative commercial loans to people looking to finance a masters' course. The target group was people enrolling in masters' courses in the UK.

StudentFunder analysed a range of student finance initiatives around the world and designed a loan to finance professional courses in the UK in a fair and equitable manner. Rate of repayment and terms:
• Arrangement fee: 4%
• Annual rate: 7%
• Grace period: 18 months
• Term: 7 years
The cost and timeline was £350,000 running costs and £350,000 loan capital.

The outcome was that 49 students received loans over the course of 2014. As of January 2016, they are all repaying their loans on time. One loan has been fully repaid. Similar loans can be offered to students in their final years of undergraduate or doctoral study and students on short courses.

Even with the proposed government funded loan being implemented in the summer of 2016, the market for private student loans in the UK is large enough to make alternative providers viable. Some universities are already working with them to ensure applicants have a range of options and choices that suit their financial needs.

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4. The role of higher education in developing employability skills and industrial competencies

a. Putting key skills back on the agenda: Improving employability through integrated training

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Introduction

Taking a postgraduate (PG) degree in a specialist subject with the aim of securing a degree that enables career entry demonstrates commitment. Whether the career is in the commercial, non-commercial, or academic world, the key/soft skill set is changing. In an ever-increasingly competitive job market, employers need PGs with an extended range of soft skills that will add value to their organisation. Ultimately, the role of higher education is to prepare the next generation of knowledge workers. This paper describes the new skills needed by our PGs in a changing workplace and how to integrate them into the PG curriculum to produce 21st century independent, employable knowledge workers. We define such skills as those that enhance and add value to, and beyond, hard job specific skills requiring specialist knowledge and technical ability. We define knowledge workers as any employee that has to utilise information and knowledge to perform work tasks.

Knowledge work and key skills

The role of the knowledge worker became more distinct as a result of the onset of electronics, IT and automated production in the 1960s – the third industrial revolution. It is estimated that there are around 600 million workers globally that are performing knowledge intensive tasks that add value as part of their regular work. Knowledge work requires the analysis, synthesis and manipulation of knowledge. The fourth industrial revolution uses smart technology to cover a greater range of previously human tasks and amplifies the importance of soft skills, but a new range of soft skills (World Economic Forum, 2016).

Almost 60 years on, today's worker is required to be far more versatile, multi-skilled and technology-savvy because of increasing business needs for greater productivity and market share. Today's knowledge workers operate in a business environment that is more technology-driven than ever. This has implications for what a worker's role involves and the sorts of 'generalist' or key skills they need. This is very evident in small to medium businesses where workers fulfil a variety of roles. This is also becoming more common in larger organisations where staff have to apply skills to a similar level as those well-versed in the discipline.

The general consensus as to a definition of knowledge work is a role that it comprises knowledge-based tasks that require the application of intellect, creativity, analytics skills and a more complex set of interdisciplinary skills. These skills are consistent, regardless of the industry sector.

The business environment and the knowledge worker are rapidly evolving, yet what is categorised as key or soft skills have not (Fernando and Cole, 2015). This is peculiar because we believe that it is precisely these skills that will give a business competitive advantage going forward. And we aren't alone in this thinking. Recently the World Economic Forum published a substantial report on the evolution of workforce skills in industry. We also see a wider range of key skills being utilised at start-ups and businesses at the cutting edge of innovation. Greater value comes from articulating and acting on opportunities, together with the timely recognition of problems in ways that lead to solutions. While still relevant and absolutely essential, we would argue that the 21st century skillset is expanding beyond the common core areas of:

- Communication;
- Teamwork;
- Problem-solving;
- Critical Thinking;
- Decision Making;
- Project Management.

This view that skill requirements are evolving is supported by various sources such as LinkedIn (LinkedIn, 2016), that analyses the skills requirements of job adverts placed on its service as well as the profiles of its 700 million or so users. Every year LinkedIn publishes what the most desirable skills are based on their datasets. So far some key skills have featured in their lists every year, and it is interesting to see additional key (non-specialist) skills emerging such as creativity (valuable for problem solving) and data analysis.

Four cornerstones of skill competencies

Our own research and view suggests that as a result of the on-going transformation of modern business there are four cornerstones of key skills competencies:

1. Collaborative social interaction: from communication to teamwork;
2. Analytical and problem solving skills;
3. Financial responsibility;
4. Autonomous: self-development for adaptability (through lifelong learning).

These expand to facilitate insight and add value:
- Creative thinking;
- Data analysis, manipulation, and presentation;
- Understand and model organisational requirements and processes;
- Financial responsibility and resourcefulness;
- Digital collaboration.

The World Economic Forum recent report, entitled the *Future of Jobs*, forecasts the essential skills in 2020 in light of the imminent fourth industrial revolution. According to the report a number of key skills such as creativity, cognitive flexibility and emotional intelligence will be needed by 2020, but not all of these are considered essential in 2015.

Finally, it's worthwhile to note that it isn't just abstract organisations and job websites that are taking key skills seriously. McDonald's the fast food outlet commissioned a study into the impact of soft skills on the UK workforce and found that soft skills will contribute £109bn to the UK economy, yet over half a million employees will be held back by a lack of soft skills (McDonald's, 2015).

Higher education needs to take key skills seriously

The longstanding relationship between Higher Education (HE) and Industry was that the latter would receive graduates who were work-ready and possessing the technical and key skills to deliver business value quickly and with little additional training. However, recent years have seen a reduction in terms of HE delivering a 'finished product' to employers. The aforementioned employers would then have to invest greater time, effort and energy to get the graduates working effectively and delivering value.

This isn't entirely HE's fault as, while many or most institutions offer some sort of key skill development opportunities, students don't necessarily understand the value and impact of evidencing them. But to say that HE's approach has been anything but tardy and not well implemented would probably be an understatement.

So why is there an issue with key skills in HEs? We tend to take a very trivial view of key skills and therefore risk miscommunication of their value and impact, as well as not giving them sufficient coverage in the teaching and learning experience. There's also the matter of academic staff potentially failing to

understand the significance of key skills in employability and half-heartedly integrating key skill development and assessment into their course modules.

We've identified the following list of challenges with successfully implementing key skills:
1. Lack of subject expertise and experience;
2. Lack of resource;
3. Poor communication of key skills value;
4. Sub-standard integration of key skills in curricula;
5. Limitations in delivery and monitoring;
6. Technological limitations
7. Ensuring engagement;
8. Assessing proficiency;
9. Optimising completion of training.

Reintegrating key skills with HE postgraduate study

We must take a multi-phased approach to re-integrating key skills with academic study because we can't do it meaningfully in one hit in the time needed. A solution adopted at Kingston University is to partner with a training company. They offer a coherent portfolio based on the capability requirements of the modern knowledge worker. The courses are designed to address specific areas of workplace performance and are all practice-based to maximise the learning experience. For us the key point is they use a unique learning algorithm, which creates a unique adaptive learning pathway for each learner based on their needs, proficiency and work context. It is using smart digital fourth industrial technology now.

The learner can evaluate their progress because 'IQ' proficiency is established at the start of the course. Plus, each learner has an individual learning pathway generated automatically for them. PGs often have work experience and this is taken into account in adapting the digital learning content to focus only on specific content items they need to learn.

Accelerating productivity and impact of the new graduate in the workplace

Taking a phased approach has a number of advantages:
1. Puts focus on communication and adoption;
2. Allows for light touch integration through highlighting the relationships between taught modules and key skills training;
3. Integration through loosely coupled assessment;
4. Provides a model for long term integration of taught modules and knowledge worker key skills.

By taking an iterative approach to integrating key skills so they are a focus of the teaching and learning experience, it can significantly reduce the likelihood of a half-hearted, poorly informed attempt at a 'big bang' approach. The learning, data and experience from implementing each phase can be progressively built on. This will ultimately lead to a refined and evidence-based solution that has lasting impact.

The first phase (see Figure 1) allows high quality key skills training to be offered to postgraduate students without having to make significant changes to the teaching and learning experience initially. This creates the opportunity to put the focus on communicating the importance of knowledge worker key skills and getting PG students to engage in developing them alongside their study. This phase is mediated through awareness-raising from the university and employability team, and supported by the personal tutoring system.

Figure 1

Our **Phase One** solution:
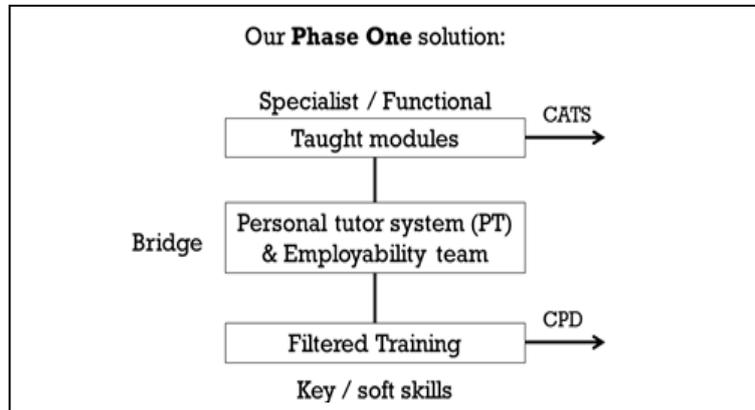
The second phase (see Figure 2) builds on this through having module leaders relate module content to learning outcomes for relevant key skills. This provides a more guided and contextually relevant learning experience for the PG student. The phase directs the focus of the student, so they are developing key skills that are complementary to their current modules, and provides the opportunity for a deeper learning experience.

Figure 2

Our **Phase Two** solution:
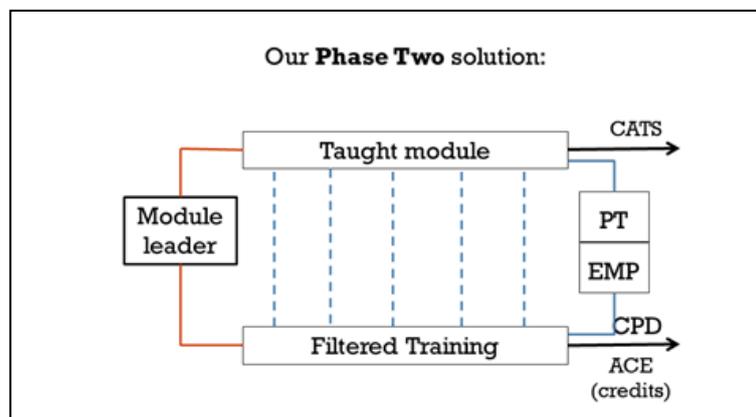
The third phase (see Figure 3) looks to tie the module learning outcomes and assessment with relevant key skills development. The training is incorporated into assessment either by:
a) Setting a performance requirement for the training that counts for a proportion of the assessment; or
b) Specifying assessment components that will require the demonstration of specific key skills for successful completion of the assessment.

Figure 3

Our **Phase Three** solution:
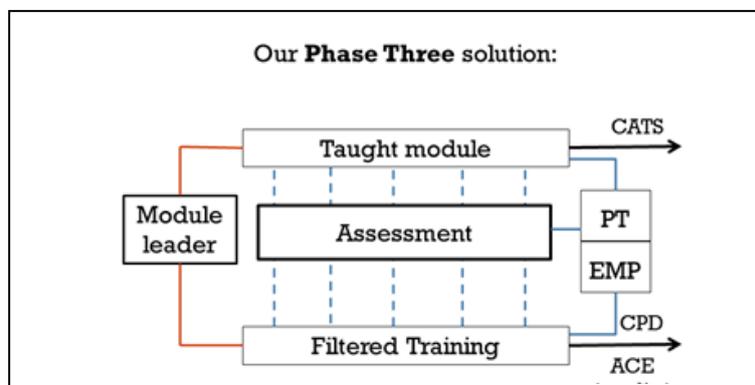
The final phase (see Figure 4) takes the progressive development and experience of the previous three phases and integrates key skills training and assessment directly into either:
a) Taught modules across the curriculum; or
b) A single taught module specifically on knowledge worker key skills.

Figure 4

Our **Phase Four** solution:

Taught module

Key Skills Assessment
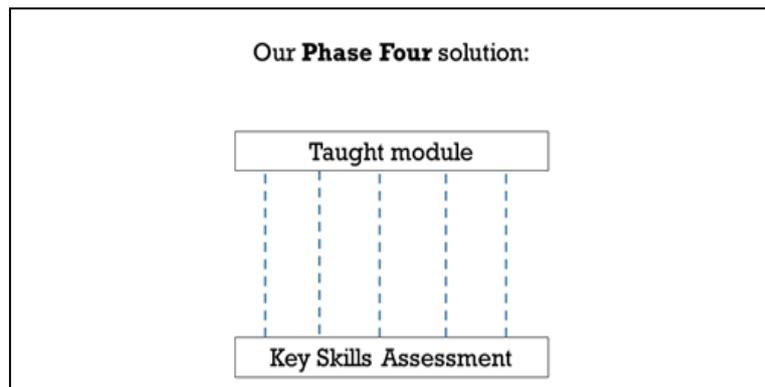
Conclusion

As a HE institution, one of our significant goals is to produce PGs that are 'work-ready' and join industry as modern knowledge workers who can quickly add value to their employers. A major part of this over the years has been to ensure that PGs were equipped with the key skills needed to be effective knowledge workers. We have lost our way with this somewhat. With a very different business environment having emerged from the recession and the fourth industrial revolution right around the corner, the time to put key skills back on the agenda is now. This is especially essential as key skills have evolved to enable this new world and will be the significant point of professional differentiation going forward.

At Kingston University, we recognise that the process of putting a focus on key skills as part of the PG experience will not be easy and will take time. To that end, we have partnered with a training provider that specialises in this area to help us with our journey. By taking a multi-phased approach to reintegrating key skills with the PG teaching and learning experience, we believe we will succeed in producing PGs that are 'work-ready' modern knowledge workers who stand out and add significant value.

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b. Meeting industrial competency from within higher education: Linking learning outcomes to industrial competency

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Introduction

Traditionally, United Kingdom companies recruit employees with postgraduate qualifications into trainee management positions with the expectation that success in the rigour and discipline of Higher Education will fit them for such roles. Whilst such soft skills do transfer (and are required traits), they are no longer sufficient for employers who, driven by efficiency and commercial advantage, seek candidates more able to fill these more demanding and higher level roles. In modern companies, the capabilities of an employee are explicitly captured in a competency framework, matched to the role required to be fulfilled. Such frameworks typically define competency into three areas: knowledge, skills and attitude. Higher Education is not well placed to support each trait, but can focus effectively on the knowledge area and, to a lesser extent, the attitude area. This paper discusses the viability of matching learning outcomes to the knowledge requirements of competencies within the systems engineering sector to develop students who are more industrially-ready. In addition, it is shown how the modularisation of modules in which such knowledge is gained can allow their delivery as standalone Continued Professional Development, allowing Higher Education to become a preferred provider of this aspect of the competency framework.

Setting the scene

Previous UK Labour Government policy was predicated on 50% of school leavers progressing to University, resulting in the continued growth of Higher Education (HE) and the generation of a significant number of graduates seeking employment in the work place. However, this 'push' approach is not guaranteed to produce the most appropriately equipped graduates, given the Browne Report's focus on HE development support being driven by student desires (Browne, 2010). This is particularly pertinent in the engineering field, which is less popular as a career choice with school leavers (Hodgson *et.al*., 2004). Whilst HE has a responsibility to satisfy the 'push' (forward feed) of governmental aspiration to provide significant numbers of graduate employees into the workforce pool, there must also be a focus on the 'pull' (demand) requirements of industry. Increasingly, HE output has an obligation to more fully satisfy the requirements placed on prospective graduate employees by industry, as it seeks to maintain competitive edge. Modern apprenticeships fulfil an important role in providing the knowledge and skill-sets required by industry, but do not sit well with university ethos' or capabilities. Apprenticeships are presently well supported by further education (FE) Colleges who are often better resourced to develop the higher levels of practical, psycho-motor type skills than are the more academic environs of HE. However, the onus remains on HE to more effectively satisfy the employers' 'pull' requirements where competencies are predominantly knowledge, or attitude-based through the provision of highly academically qualified graduates with pertinent, usable skills in their engineering programmes.

Industrial competency

If there is to be a greater focus in HE on meeting employer needs, there needs to be some form of metric by which satisfaction can be assessed. Industry already has a set of measures by which it measures its workforce capabilities in the form of competencies. Typically, as proposed by the International Council on Systems Engineering (InCoSE) in their Competency Framework (ICSE, 2010), these are composed of knowledge, skills and attitude elements. The InCoSE Framework considers the knowledge element to consist of 2 aspects: understanding and domain knowledge (see 'Systems Engineering Competency' section for further detail). Specific levels of each of these are required to define an individual as capable of carrying out a specific task or responsibility defined by the competency. Higher levels of capability in each aspect can be used to identify enhanced capability, such as practitioner, or expert, in the particular competency. With such a measure in place, it would be appropriate for HE to utilise it in attempting to more closely meet industrial needs for graduate employees. Typically, a competency would be satisfied by the owner undertaking a recognised training syllabus and then demonstrating their capability through the successful completion of an appropriate form of assessment. These are aspects that HE is familiar with and well placed to deliver.

Higher education capability

Traditionally, the engineering disciplines within HE have been seen as capable of supplying soft skills, suggesting a level of intelligence, communication skills, self-confidence, integrity and team working skills through the award of an educational certificate (Morgan and Gorman, 2010). The more psycho-motor based skills typically reside in the domain of FE. Some large organisations, including the Military, have developed successful, focused 'in-house' delivery across all three aspects. It could be argued that the Royal Air Force's Skills & Knowledge modular delivery of its technical training, developed in 1970's, arguably remains unsurpassed in matching training needs to employment requirements and the definition of technical capabilities. However, such soft skills were not always explicit in their delivery through the sometimes abstract activities within an HE programme. Such ephemeral skills have often been supported by the even less defined abilities of logical deduction and diagnostic decomposition. The introduction of Personal Development Portfolios (PDP) has gone some way to addressing this, but these have generally still lacked any direct focus on industrial needs, despite their value in CV and testament generation (Ellis *et.al.*, 2006). Nevertheless, the soft skills of deduction, communication and human interaction remain key attributes required in the budding engineer (Shackil, 1980). Despite this lack of definition, such skills are often highly valued and this has seen engineering graduates successfully courted by the financial and other allied sectors (Hodgson *et.al.*, 2010). The reverse transfer of non-engineering graduates in to engineering can be said to have been less prolific, in part due to more defined competency criteria. However, these soft skills and capabilities remain the areas in which HE delivery is strong and also as significant requirements of the industrially ready student (defined by Back and Sanders,1998). Recognition of the need to focus academic delivery to meet the needs of industry has been well discussed in a series of publications (Back and Sanders, 1998; Lamb *et.al.*, 2010; Black, 1994), generating a number of HE initiatives such as Touch-points (Stewart *et.al.*, 2012). These have attempted to illicit employer requirements without necessarily analysing skills usage, but have not focused on the metrics already existing within industry.

Systems engineering competency

Systems Engineering (SE) provides a suitable focus for the consideration of academic development in engineering, as it not only spans multiple disciplines of traditional engineering but also takes a cost and lifecycle approach (IEC, 2008). In addition, it places emphasis on training and support, resulting in the defined Competency Framework, appropriate to SE practitioners (ICSE, 2010). Its development objectives included not only identifying competencies held by a workforce, but also highlighting weaknesses in a company's capabilities by capturing the totality of the workforce ability. It is important to note that this is not the whole answer to resource issues in industry, but provides a significant indicator. InCoSE views SE capability of comprising:
• Core Competency (Understanding);
• Supporting Techniques (Technical Skills);
• Basic Skills and Behaviours (Behaviour);
• Domain Knowledge (Knowledge).

The wording in brackets above is the Engineering Council (UK) terminology for these aspects. It can be seen that the knowledge aspect actually consists of two elements: core competency and domain knowledge. Core competency describes the base knowledge an individual would be expected to have in order to commence training for the particular competency under consideration. It might be expected therefore that this element would not be enhanced in the competency training, but may well be tested before commencement. The InCoSE Framework describes these core competencies as standalone elements within the Framework and their use is seen in a parent/child type relationship. The domain knowledge is that knowledge that is specific to the particular competency and is expected to be imparted as part of the competency training. The supporting techniques describe the technical skills required by the competency. Typically, these may be physical in nature, considering levels of dexterity or psycho-motor skills for instance.

Basic skills and behaviours describes softer skills revolving around communication, logical analysis, team working and motivation. Interestingly, the InCoSE Framework (ICSE, 2010) does not explicitly include attitude towards responsibilities of the competency as might be described in *Affectivity Taxonomy*

(Anderson and Krathwohl, 2001). This is noted as, in practice, it is an important aspect of other, allied industry competencies and often measured as a prerequisite. Typically, it can be indicated by a person's seniority or position, with training for a competency debarred to those without that seniority. This approach is widespread in the UK military, where levels of seniority are highly developed (Ministry of Defence, 2009)

In the InCoSE Framework a particular competency may be held at one of a series of levels that indicate the capability of the individual in that competency and therefore, by implication, how they might be deployed to meet an activity need. These levels include the following in ascending order of capability:
• Awareness;
• Supervised Practitioner;
• Practitioner;
• Expert.

Awareness is classed as having an understanding of key issues and their implications and is aimed more at those who will interface with those who have higher levels of the competency rather than any specific capability to carry out actions authorised by the competency itself. The supervised practitioner level describes an individual with capability in the competency, but implies a lack of experience and a continued requirement for support in appropriate delivery. The practitioner level is used to indicate a full capability, with detailed knowledge and a capacity to guide and advise. The expert level describes an individual with extensive knowledge and experience in the area of the competence. Such an individual should be suitable to analyse and evaluate the competency.

Higher education competency alignment
A competency framework, such as that provided by InCoSE for Systems Engineers, provides a viewpoint on the knowledge, skills and effectiveness (attitude) required by industry. HE is well placed to satisfy successfully the knowledge/understanding aspects of industrial competencies, with some significant capability in that of effectiveness. Interestingly, within the SE field, a series of supporting techniques include modelling and analysis techniques. These also fall within the scope of HE's expertise and can be delivered effectively, as exampled in University of York's Safety Critical Systems MSc, on which a series of safety analysis techniques are delivered. Typically, as prescribed by the Quality Assurance Agency for Higher Education (QAA), Programme Outcomes (PO) at level 6 (Bachelors) expect:
• a systematic understanding of key aspects of their field of study, including acquisition of coherent and detailed knowledge, at least some of which is at, or informed by, the forefront of defined aspects of a discipline;
• an ability to deploy accurately established techniques of analysis and enquiry within a discipline;
• conceptual understanding that enables the student:
    o to devise and sustain arguments, and/or to solve problems, using ideas and techniques, some of which are at the forefront of a discipline;
    o to describe and comment upon particular aspects of current research, or equivalent advanced scholarship, in the discipline;
    o an appreciation of the uncertainty, ambiguity and limits of knowledge;
    o the ability to manage their own learning, and to make use of scholarly reviews and primary sources (for example, refereed research articles and/or original materials appropriate to the discipline) (QAA, 2008).

Such requirements placed on programme design by the QAA are aligned with the requirements of competencies, causing little conflict of interest or difficulty in devising PO or LO that meet both needs.

HE programme design and delivery does not occur in isolation. Whilst it will be influenced by the research interests and capabilities of involved staff (their competencies), it should primarily be dependent on the viability of the programme as assessed through market testing. By assessing the competencies required in perceived market areas, PO and LO can be aligned to competency needs during programme design to develop coherent programmes, closely aligned to industry needs. The need for a programme to be current, whilst also meeting future needs, could potentially be compromised by such an approach if competency

requirements are incorporated. However, the stability of the InCoSE Framework (first issued in 2005) gives confidence in this respect. Graduates from programmes developed in this manner would be more immediately productive and would reduce the development overheads for an employer.

HE competency satisfaction

In designing a HE programme in systems engineering, core competencies would be ready candidates for programme alignment. It would not be difficult to envisage that the framework-defined areas of systems thinking, holistic lifecycle view and systems engineering management could be covered by PO. In addition, the specific competencies identified by the framework under these headings would be suitable subjects for LO development and coverage at module level. Typically, systems thinking is currently covered by three defined, standalone, competencies covering systems concepts, super system capability issues and business and technology environment. This decomposition along competency lines would provide a natural coherency to such a designed programme.

In addition, the softer basic skills and behaviours can be less well-defined in industrial competencies, but these are areas where HE teaches and examines, both implicitly and explicitly, within many engineering programmes. Analysis of typical target market requirements may help hone particular LO and also provide opportunities for innovative examples to be 'pushed' to industry. Supporting Techniques can include academically based activities and analysis techniques typified by the Failure Analysis, Requirements Analysis and Safety Analysis mandates of the InCoSE Framework. HE is ideally positioned to deliver such skills with knowledge and experience that is likely to match that of industry, but in a purpose built environment.

Through the alignment of competencies and LO, it is feasible that core competencies to a practitioner level could be achieved from within HE (particularly where work placement is included). For other competencies, practitioner or expert levels of knowledge could be achieved as key elements of the building blocks for such awards. The academic environment is structured to deliver and assess in ways that mirror the requirements of industrial competencies, but its systems, experience and capability maturity are likely to outstrip that of industry itself. There would therefore seem to be distinct advantages in more closely aligning learning outcomes within taught programmes to the knowledge, affectivity and, where appropriate, skills-based aspects of competencies in industries related to programme subject areas. By using the template competencies suggested by overarching guilds or Professional Engineering Institutions (PEI), such as InCoSE, to focus programme module learning outcomes, there would be a symbiotic reinforcement of the guidance provided by such bodies, whilst providing focus to learning outcome definitions. Such an approach would also support accreditation bodies in the definition of course content required for their award and support. Typically, a PEI such as the Institute of Mechanical Engineers (IMechE), requires industrial involvement to be included in the programme curriculum (IMechE 2007) required through a series of output standards. The linking of competency requirements to these accreditation standards would provide coherence in the development of industrial graduates.

Continued professional development (CPD) and personal development portfolios (PDP)

The provision of module learning outcomes focused on industrial competencies allows the delivery of the module as CPD, allowing the company to take advantage of high quality academic delivery in meeting its competency knowledge requirements. This may involve the amalgamation of existing material into bespoke CPD packages or the sale of existing module deliveries as CPD.

In addition, personal development portfolios have come to the fore in recent years within the HE environment and are often in electronic format (Pegler et al., 2007). This tool allows the student to collect evidence for developed personal skills and identify development strategies for their development whilst in the HE environment. As such, these can provide valuable evidence for the achievement of softer skills required within an industrial competency. By structuring the PDP activities of students to align with industrial competency needs, coherency and promotion of these activities can be enhanced.

Conclusion and advice

In order to stay competitive, industry requires a continually developing, capable workforce with defined knowledge, skills and attitude requirements. It is a core business of HE to deliver knowledge and, as such, is capable of providing a higher standard of output than is achieved 'in-house' within industry, particularly for smaller firms, which employ the majority of the UK's industrial workforce.

HE already delivers knowledge and understanding as well as some technical skills. But this is not focused on industrial needs. It is arguable whether HE should influence industrial competence in a 'push' manner or whether industry should require specific knowledge from HE in a 'pull' format. In practice, both may be applicable as each learn from each other, in liaison with Professional Engineering Institutions.

Matching industrial competencies to academic learning outcomes (by either 'push' or 'pull') will streamline more effectively the process of graduate development and enhance their employability in the work place. Focused HE delivery will make graduates more industry ready and more highly prized over non-competency based counterparts. And finally, focused delivery of competency-relevant material will allow such material to be delivered separately in CPD packages.

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c. **Embedding employability in the postgraduate curriculum: a practical approach focussing on recognition and articulation of employability skills**
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Introduction

In this paper we will develop some practical ideas for embedding employability into the postgraduate curriculum. We will outline the different types of employability skills, from basic tangible skills to the higher order skills expected by employers and offer suggestions for consideration by postgraduate educators. Our recommendations focus particularly on the development of students' abilities to recognise and articulate skills developed as part of their postgraduate studies.

Employability

There are two broad ways of viewing employability. The first focuses on the rate of graduate employment, a measure often used in league tables and in government reports. The other, as summarised by Harvey (2005) suggests that employability is not simply about getting a job, but instead is about learning with less emphasis on '*employ*' and more on '*ability*'. This focus is on fitness for graduate employment (Harvey, 2005; Knight and Yorke, 2003; Yorke and Knight, 2007) and, in this view, employment itself is a by-product of an enabling process. Such an enabling process involves the development of skills, but also, as we see below, broader-based qualities relating to values, intellectual rigour and engagement (Pegg *et al.*, 2012). It is this view of employability which underpins the recommendations in this paper.

Types of employability skills

The skills and attributes sought by employers can be viewed in two ways: those that are tangible and those that are intangible (Anderson, Bohn and Harris, 2015). Tangible skills are often articulated in course specification documents and may be mapped to indicate where each skill is delivered across a course. The origins of these are the 'key skills' identified in the National Committee of Inquiry into Higher Education (1997) (often referred to as the Dearing Report) which include communication, numeracy and IT. Such skills can also be assessed using tangible marking criteria (e.g. presentations assessed by marking the timing, visual aids, linking between presenters etc.). It is not the intention of this paper to focus on these skills.

However, other less tangible attributes are also seen as important: qualities such as an ability to get things done, taking the initiative and the willingness to persevere with difficult tasks have all been identified as qualities that 'count' in the workplace (Yorke and Knight, 2007). This has led to the development of 'Graduate Attributes' at many institutions, where these higher order qualities are articulated in policy and institutional documentation for use by course teams. These are less easy to assess with objective criteria, although arguably are as important to employers as the tangible skills. Again, it is not the intention of this paper to focus on the development of these skills. In addition to tangible and intangible skills, we have also seen the development of another level of abilities, this time related to how the graduate is able to articulate the skills acquired during a course and make connections with the world of work.

This move away from employability as simply skills towards a wider set of abilities related to reflection and articulation of learning (Pegg *et al.*, 2012) is seen across much of the literature. Models have been developed to explain what employers are looking for as a way of encouraging and guiding employability developments both within and alongside the curriculum. Knight and Yorke's (2003) USEM model is often referred to in identifying understanding, skills, efficacy beliefs and metacognition as key aspects of what makes a graduate employable. Metacognition, or the ability to know about particular strategies for problem solving and an awareness of the usefulness of knowledge, is particularly important in these models to ensure that graduates highlight their skills and attributes to employers.

In a further attempt to make the concept of employability more explicit and to provide a tool for those involved in employability activities, Dacre Pool and Sewell (2007) developed a practical model of employability, identifying how aspects of a student's experiences at university could combine to make them more employable. Via reflection and evaluation, the model suggests that students are able to develop self-

efficacy, self-esteem and self-confidence leading to an increase in their employability. Reflection and metacognition have also been identified by Junghagen (2005) as a way of achieving the higher order thinking skills sought by employers.

Most important employability skill

In our view, this understanding of the tangible and intangible skills developed and the ability to articulate these for employers is the most important type of employability skill for the student when applying for jobs. Being able to link the skills developed on a course and the requirements of an employer is crucial for our graduates. Whilst some links are obvious, such as the ability to use software packages like Solidworks, others, such as an ability to deliver a project on time or to persevere in the face of adversity, are less apparent and the onus is on the graduate to recognise when these have been achieved. As with Cole and Tibby (2013), we recognise the importance of reviewing not only what is taught on a course, but also how it is taught, with an emphasis on developing students' abilities to recognise their own achievements: personally, academically and in relation to career development. In the following practical examples, we offer suggestions as to how educators can contribute to the development of these abilities and enable our students to articulate them. Our recommendations are inspired by Knight and Yorke (2003) who suggest

> '*such talk needs to be underpinned by careful thought about how learners might best be put in positions where they can....... make good claims to employability*' (Knight and Yorke, 2003: 7).

Practical support

The evidence above suggests that there is no doubt that reflection and metacognition are crucial aspects for employability, especially if students are to recognise and articulate the knowledge and skills they have developed during their studies. With this in mind, we have developed three practical examples of how students can be given tasks which will encourage them to recognise and articulate their achievements and, in turn, to link them to the qualities sought by employers. The three examples have been used for two years on a taught postgraduate course at a UK university. Each task counts for a small percentage (5-10%) of the module grade, thereby increasing the likelihood of engagement by the majority of students.

1. Reflective careers portfolio

This task requires students to develop a reflective portfolio following attendance at three career-related events, such as 'Spotlight on Engineering Careers' or opportunities to meet employers at careers fairs. Although it would be best delivered within a specific module, the reflections could incorporate all or several modules studied on a course. In brief, students are instructed to attend at least three career-related events either organised by the institution's careers team or elsewhere. Marks are awarded for insightful reflections which demonstrate how students link the content of the events to their own studies. In addition, students are asked to discuss how the event has influenced their thinking about their career direction. Did it confirm their choices, did it inspire them to consider alternatives, did it encourage them to consider further development of any skills or knowledge?

The difficulty of this task is that students, especially on technical and scientific courses, may not be comfortable writing in the first person. Equally, the marking does pose problems in that there is no absolute right and wrong; in this task marks are awarded for the student's ability to link the content of the session to their course and their discussions about career choices. The organisation of this task requires collaboration with the institution's careers team. It works best when the communication of career-related events is integrated into the module and where the careers team are able to access the students during class time to promote the careers events on offer at the institution and elsewhere.

2. Reviewing job advertisements

This is a task which can be integrated into any module, regardless of discipline, as the task can be tailored by the choice of job advertisement. Students are presented with a real job advertisement and asked to analyse it in terms of the specific knowledge and skills required by the employer. They then map their own skills and attributes developed on the module (and indeed the wider course) against the job requirements. This is an exercise best done in a workshop to allow for discussion amongst students, supported by a combination of teaching staff and careers staff. As some of the less-tangible skills developed may not at

first be obvious, it is useful to be able to guide the discussion and allow students to see for themselves the wealth of skills and attributes they have. This would then be written up individually.

3. Producing a standalone management recommendations report from an academic dissertation
This task was introduced after a student secured a job by approaching potential employers with a 1000-word management report from his 12,000-word, largely theoretical dissertation. By replacing a section on 'practical implications' or 'management recommendations' with a self-contained management report, students are able to focus on how their research relates to the outside world. In addition to making connections with the workplace, there is also a valuable skill in being able to precis large volumes of information into manageable formats.

General recommendations
Tasks such as those described above will work best if they are assessed to ensure completion. In our own institution we have found that an allocation of 5% to 10% to each task within a module has been sufficient to engage the students. Course teams would need to review the overall curriculum and identify where each task best fits into the content. Course teams also need to consider the balance between employability support delivered by the institution's dedicated careers teams and the academics. In the examples above, there is an incentive to complete each of the tasks due to the allocation of marks. We would argue that an integrated employability programme works best where some generic employability support is offered by a dedicated careers team (e.g., CV writing, job search, interview skills) in conjunction with tasks embedded in the academic curriculum, designed in consultation with careers teams. This requires early collaboration between course teams and careers teams to ensure practical logistics are taken into account (e.g., timing of briefings and submissions to ensure students have enough opportunities to attend careers events in example 1.)

The examples are all currently embedded in a taught postgraduate course. However, the approaches lend themselves equally to undergraduate courses, in particular at level 6 when career plans are being developed. Alternatively, where students are applying for work placements, the first two tasks would fit well.

Conclusion
Whilst the development of tangible and intangible skills and attributes is an important part of curriculum design, we argue that students need to be able to recognise such skills and have the ability to articulate them for future employers. Tasks which ensure that students reflect on their skills can enhance their employability as much as acquiring the skills themselves.

Advice for development and implementation
- Course teams should identify the different levels of skills and attributes to be developed during the duration of the course.
- Distinguish between the three levels of skills:
  - Tangible skills such as numeracy, communication, IT (often articulated in programme specifications;
  - Intangible skills such as an ability to get things done, work to tight deadlines (often identified in institutional "graduate attributes");
  - The ability to recognise and articulate the skills acquired during a course and make connections with the world of work;
- At the course level, involve careers teams to plan the embedded activities, in particular where they link with careers events.
- Ensure module level collaboration between academics and careers teams where assessed activities are embedded in the module assessment.

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d. **Manufacturing, materials and design postgraduate education: Reflections on aspiring to excellence**
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Introduction

A foundational event hosted by Cranfield University was initiated by a call for further research into best practice and the attributes of achieving excellence in manufacturing, material and design postgraduate teaching and learning. Representatives from the Higher Education Academy, Engineering and Design Accreditation Bodies, Engineering Professors Council, National Centre for Universities and Business, manufacturing, materials and design industries and a wide range of UK universities came together to discuss the future of postgraduate education. The discussions, findings and outcomes from the event, and particularly the world café, have been captured in this report and will be of value to a range of professionals across higher education institutions who are involved in the management, design, delivery and marketing of postgraduate taught courses. The findings in this paper will also be of benefit to researchers and practitioners interested in improving the student experience of postgraduate students.

Overview

There has been a dramatic expansion in the postgraduate student body in the UK in the past 15 years with enrolments growing by 45% between 2003 and 2010 (Morgan, 2013). Extensive research has been undertaken in the field of the student experience, teaching and learning at undergraduate level, but research in the area of postgraduate education is significantly lacking. The Higher Education Commission commented in 2012 that *'Postgraduate education is a forgotten part of the sector'* (Higher Education Commission, 2012:17). Furthermore, the Postgraduate Taught Experience Survey (PTES) results increasingly provide a disappointing read to providers of postgraduate education in terms of delivering a high quality student experience. Student dissatisfaction has been proposed as one of the reasons for the decline in Engineering and Technology postgraduate student numbers of -13.5% (full time) and -15.4% (part time) over the last two years.

Our rapidly changing economy is placing greater demands on the skills and expertise of the workforce. To compete in the global race, we need to equip our future leaders with the skills to adapt, innovate and flourish. Given the rapid technological change we are facing, science, technology, engineering and mathematics (STEM) skills are vital. As our economy recovers and rebalances, a major review looking at the future of engineering in the UK, the Perkins Review (2013), asks whether the current arrangements for the provision of engineering and manufacturing knowledge, skills and abilities are fit-for-purpose.

There is a serious risk that, if we do not act now to secure the future viability of the talent pipeline for engineering, falling student numbers could lead to a new wave of skills shortages. The National Centre for Universities and Business report (2014) has highlighted a mismatch between the specialist subjects being studied at postgraduate level and the flexibility, agility and work-readiness competencies being demanded by industry. Perkins (2013) suggests that there is a need to invest in the quality of the teaching infrastructure and for higher education institutions to engage with employers to ensure that their provision is world class and in line with industry expectations. This concern is supported by the report Engineering the Future (2014) which suggests that manufacturing organisations perceive *'academia is letting the country down'* and that businesses are required to *'teach our recruits the ways of the world before teaching them about the business'* (p.27). These drivers signify an urgent call to action and further research in the area of postgraduate education, providing the motivation for this paper. This paper reports the findings from an event held at Cranfield University which aimed to explore the key areas of concerns and to contribute to the postgraduate education debate.

Methodology

Having identified the need for further research, a workshop was identified as an appropriate method for bringing together a wide range of participants to discuss a complex and multi-facetted topic (Robson, 2002). The workshop was advertised through a number of websites, newsletters and direct invitation by

email across the field of manufacturing, materials and design postgraduate education. A daylong workshop on 8 May 2014 was attended by 48 participants consisting of academics, postgraduate students, members of the Higher Education Academy (HEA), Institute of Engineering Design, Engineering Accreditation Body, Engineering Professors Council, Consultants and industrial organisations.

The format of the workshop was arranged to include a mixture of expert input presentations, round table discussion and panel debates. The workshop aimed to encourage honesty and collaboration in exploring the overarching questions:

- What is current 'best' practice in postgraduate education?
- How can excellence in postgraduate teaching and learning be achieved?

During the input sessions, a range of speakers from the HEA, accreditation bodies, and industrial organisations were invited to make short presentations providing insight into measuring best practice, current challenges in education and future visions. A round table discussion, sometimes referred to as a 'World Café' followed and was facilitated across eight tables with a unique question on each. Participants were given the opportunity to debate three questions for 15 minutes per question before a facilitator from each table had 2 minutes to feedback to the room. The questions, presented in Table 1, were generated from a review of several relevant papers surrounding the areas of postgraduate engineering education (Perkins, 2013; Foresight, 2013; Industrial Strategy, 2014; ARC Network, 2013). Each table had an independent facilitator to introduce the question and continue the momentum of the discussion and a scribe who took notes of all the conversations throughout the session.

Table 1: World Café Discussion Questions

Table	Discussion Question
1	What could the BEST postgraduate course look like and how can current education achieve this?
2	What is the purpose of postgraduate education?
3	How can postgraduate education be more inclusive?
4	What are the key elements of a high quality postgraduate experience?
5	Are postgraduates equipped with the right skills, experience and knowledge for industry?
6	How should postgraduate education be assessed?
7	What do postgraduate students in manufacturing, materials and design need to learn?
8	What methods of teaching would you consider to be the 'best' or exemplary'?

The day concluded with four short presentations and a panel debate from the Universities of Cambridge, Warwick, Cranfield and the Royal College of Art, which provided a platform to share, learn and investigate ideas for the future of postgraduate education. The content of all presentations from the day and the notes taken during panel discussions and the world café event are summarised in the following section.

Key findings

Content
Participants widely acknowledged that technical content and subject specialists are important and a good foundation in mathematics and science is expected. The taught technology should be cutting edge. Accrediting bodies report good practice incorporating the latest industrial technology by involving Industrial Visiting Professors and Teaching Fellows and/or technology derived from university research work including technology from other universities' research work (rarely observed). In addition, content and activities need to reflect sustainable development, design and manufacture and the circular economy, to be socially responsible for and with technology. It was suggested that postgraduate education should also have relevance to the global economy and changes in economy.

Transferable skills

It was generally recognised that, in addition to technical skills, a range of transferable skills are essential in a good postgraduate. Of the top ten skills sought by employers recruiting postgraduate students, the highest valued is analytical thinking. Valued equally highly were subject specialist knowledge, research, technical skills, new ideas and/or the ability to help innovate.   A strong case was made that a focus for postgraduate education should be raising the potential for future leadership. Management and leadership skills were emphasised by employers, as well as the need for flexibility and practical skills, which appear to be in short supply. Employers also deemed qualifications to be less relevant than other attributes.

High level skills (postgraduate or level 7 skills) are key to driving innovation, entrepreneurship, management, leadership and research and development.   A range of transferable skills which can align to business and drive innovation include: communication, team working, integrity, intellectual ability, confidence, creativity. Universities need to get the balance right between technical and transferable skills.

Teaching and delivery styles

Teaching has been identified as the key influencer of student satisfaction. There is little appetite for lectures as one-way transmission of information, as teaching should tap into passion, enthusiasm, aspiration and motivation.

Future postgraduate education needs to focus on knowledge navigation rather than knowledge provision, since information is freely available. The range of teaching should reflect the range of learning styles. Enquiry based, flipped classroom, problem-based and tutorial-based ways of working allow students to lead the teaching. Student-led teaching addresses engagement, responsibility and pace. There was a recurring feeling that action should be tailored to specific needs as there is no one-size-fits-all solution. Postgraduate education could be more inclusive through blended learning; combining distance learning with on-site course work offers flexibility. Continuous improvement of courses can reflect industrial need; the changing economy and lives of students also requires flexible delivery. Universities should cooperate in designing and delivering higher education that enables the use of shared resources.

Practitioner-led education to contextualise taught principles was suggested to encourage deep learning and innovation. Learning through practice via project work, particularly group projects, was highlighted by all, although it was acknowledged that not all students undertake industry-based projects. Briefs, which include a business element or the innovation of a product or process, are critical. Enterprise initiatives and links with industry and commercial sectors are helpful, as well as bringing together different strands of learning, and collaborative and cross-disciplinary working.

Assessment

Findings from PTES 2013 are that across all institutions 'assessment and feedback' has the least satisfaction (lowest marks) and is therefore of critical concern. Feedback needs to be fit for purpose and should drive confidence; students should want to be assessed to demonstrate their learning.

Concern was raised that while attention is on marks and assessments aligned to technical demonstration then this is where students will focus. Assessments also need to address transferable interpersonal skills. A variety of assessment is important; suggestions were to address 'value added' more than 'knowledge added', and to include competency and context specific communications, including the capacity for reflection. Peer group involvement for feedback and feed forward develops constructive criticism and discussions. Building acceptance of failure (and reflection) into the assessment process was suggested. Employers suggest there is no indicator of leadership or work wisdom and therefore assessments with such indicators maybe advantageous. Thus, learning outcomes could be measured in terms of students' capacities to build new knowledge, their ability to problem-solve, to be proactive, to lead their own learning effectively and to lead others.

Personal Development: teachers and learners

Teachers are required to facilitate effective navigation through the available information, providing guidance and direction. The role of a teacher is to help students learn the skill of 'how to learn' and consolidate the learning. Context is important, as is setting clear outcomes that harness context; good design of problems with challenging high-level focused activities and problems (using the latest technology). Learners need to practice problem solving and implementation rather than just learning through case studies. It is important to create a learning environment where students can practice transferable skills and be challenged and stretched. Postgraduate education should be seen as an opportunity to pressure test ideas and to develop, as a personal development tool.

Identifying the key skills of learners at the start of the course is important, as is the inclusion of opportunities for self-reflection and 'breakdown moments'. It was suggested that students don't want to go into postgraduate study to polish the skills that they learned at undergraduate; they want postgraduate study to be challenging, they want to be taken to the edge and further, they want a revolution! Indeed, the postgraduate experience should be embedded as lifelong learning. For both teacher and learner, postgraduate education was recognised as a partnership of assisted peer-led learning.

Universities report they value staff with industrial experience, indeed one example was of 90% teaching staff having worked in industry, and it appeared that part-time teachers who also work in industry could be common practice in the future. Participants suggested that universities should encourage flexible contracts to enable a simultaneous career in industry and academia. However, discussions highlighted that research-active staff should not be undervalued and that a balance of both types of influence is required.

Discussion

Perceptions and requirements of postgraduate education are changing rapidly along with the cultural and economic backgrounds of our global students. A wide range of attributes considered necessary for 'excellence' in postgraduate education were identified and suggestions for what future models of postgraduate education might look like were explored.

Industry-led learning

Throughout the day, concerns were raised surrounding the perceived gap between postgraduate education and industrial practice. Universities will need to move swiftly to meet the future needs and requirements of the manufacturing, materials and design sectors. Steps to address this gap could include the re-orientation of postgraduate education towards a career-driven output including entrepreneurial and start up activities, with content that reflects what graduates are more likely to do.

Giving employers the confidence that postgraduate institutes can deliver the skills that they require was posed as a significant challenge. Working alongside employers to provide industry-led education and courses that add value through a flexible framework for industrial professionals was offered as a model for the future, while at the same time providing a future professional network.

Lifelong learning was also offered as a solution to the concern that employers would lose members of staff after funding postgraduate study. A flexible and adaptive model for employees should offer training and education as it is needed throughout the career of an employee. Employment opportunities could be linked with assessments aligned to specialist skills, reflection, satisfaction level and experience gained. The role of University Industrial Advisory Panels was called into question and the accreditation bodies observed that Industrial Advisory Panels are very passive.

Hybrid education-incubator

A proposed model of education directly addressing the perceived gap between academia and industry was a hybrid education-incubator. It was suggested that incubation businesses could be started from within a postgraduate course, encouraging students to foster business ideas while they are studying and leave with an operational business. This provides the students with skills and knowledge that can be implemented instantly as well as benefits for the institution, which could have a stake in the business.

Content, delivery and assessment: innovation

The need for innovation in all aspects of postgraduate education was highlighted early on by the HEA, accreditation bodies and employers and was a recurring theme throughout the day. The ability to add value to an organisation through innovation was identified as a differentiating factor between employing postgraduates as opposed to undergraduates. Science and engineering postgraduates are proportionally more prevalent in innovating firms than undergraduates (UKIS, 2011).

Not all students have experience of innovating and it was debated as to whether an individual's ability to be innovative, self-motivate and lead change could be developed. A good change leader would need technical and transferable skills, as well as the ambition for change and improvement. Thus we need to embed knowledge and leadership with innovation.

Innovative methods of delivery and assessment that reflect the roles that postgraduates are going to fulfill in industry were deemed essential and examples included: briefs which require the development of a product or process, industrial implementation of innovation and a 'dragon's den' style assessment to pitch ideas to potential investors.

Pioneering teachers and learners

Employers and the HEA called for an increase in truly pioneering students who are capable of intellectual engagement and the application of learning, sometimes to unrelated areas (innovation), to critique, appraise and to handle uncertainty. By enrolling for postgraduate study, students have already embarked on a personal journey, a change in mindset and have flagged themselves as potential pioneers. The experience should be personally testing, an experience to stretch thinking, the synthesis and application of the learning.

Interpersonal transferable skills such as communication, leadership and integrity, as well as passion, motivation and 'belly fire', were repeatedly identified as the attributes that differentiated pioneering and more employable students. Postgraduate education institutes are responsible for facilitating the transition from students who are passive, or passengers at best, to pioneers who can drive their own education and employment prospects.

Concern over the ability of faculty staff to develop pioneering students was raised; it was felt that feedback between teacher and learner plays a crucial role in the personal development of a student. Excellence in postgraduate education requires teachers to be champions in order to develop and encourage the required skills from their students. Further research is required to establish what makes a pioneering teacher and how training in postgraduate education can facilitate this.

It is not only employers who value pioneering students, but also the postgraduate institutions themselves. Alumni who are successful and influential in their chosen careers increase the value and reputation of the university. Postgraduate education is not just about creating wealth for the UK, or about livelihood, but about excitement and discovery internationally; highest quality engagement that is life enriching, embracing global citizenship and responsibility. Universities have a global outreach with postgraduate students who will become CEOs across the world.

Flexibility, customisation and technology-enhanced learning

Continuous improvement of courses to reflect innovative practice and the changing economy was assumed to be current practice in postgraduate education; however, the flexibility to adapt to the needs of industry, organisational changes and changing lifestyles of students (flexible working and digital technologies) was also identified as a necessity.

It was recognised that people have multiple reasons to pursue postgraduate study, so the solutions to teaching and learning must also be multiple. Flexible delivery and the customisation of courses to reflect the needs and ambitions of students and their career paths is required to better reflect the diversity of the real world and overcome the gap between subjects and career options. Students could select the modules

that they want to study based on what they want to achieve in careers and transcripts would reflect the modules they selected rather than a specific course. However, there need to be clear deliverables and a clear path out of the course.

Digital technologies are lowering barriers to education and latest technologies are important as a hook to engage learners. Research is required to establish how we tap into the world of social media and personal digital devices successfully. Instead of going head to head with social media in a battle for the attention of students, we need to embrace and utilise digital technologies in more effective and creative forms of teaching and assessment.

Conclusions and recommendations
The enthusiastic and motivated presentations, debates and discussions identified some outstanding examples of excellence in postgraduate education and, highlighted many ideas for future improvement. Postgraduate education has received inadequate attention and a significant amount of further discussion, research and action is required to move towards the provision of an effective, flexible and valuable postgraduate learning experience. A range of key ingredients have been identified and this is call to action for postgraduate education, setting a challenge for how to do things differently so that we can work with industry to provide our engineers of the future with the best possible postgraduate experience. This paper is the first step towards creating a community with the common goal of moving towards, with the aim of achieving excellence, in postgraduate education.

Advice
The Excellence in Postgraduate Education: Manufacturing, Materials & Design event highlighted three main action points on which a revolutionary improvement in postgraduate education could be based:
1. The development of a Manufacturing, Materials and Design Postgraduate Education Road Map that links to those of technology and business
2. A clear taxonomy of postgraduate education across sectors
3. Research into all aspects of postgraduate teaching, learning and overall experience in collaboration with industry; specifically answering the questions:
   - How can the gap between industry needs and postgraduate education be reduced?
   - How can postgraduate teaching, delivery and assessment better reflect the requirements of future careers?
   - How can postgraduate education provide the required flexibility to adapt to changes in industry needs and student lifestyles?
   - How can advances in digital technology be harnessed within postgraduate education?

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5. Working with business and industry to provide flexible courses fit for need

a. **Balancing career and capability requirements in the engineering sector: A flexible PG framework integrating employer and employee skills and competency development**
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Introduction

Economic and demographic changes in the UK are happening now and are expected to be far ranging. To survive in the global economy, the UK must keep its innovative and competitive edge.
To do this, businesses and universities need to build closer relationships, involving flexibility on both sides, to achieve the workforce expertise required in this rapidly changing environment. A key area to enable this transition is in flexible lifelong learning study programmes, designed to support both individual career aspirations and organisational development. This case study identifies a flexible mechanism developed at the University of the West of England (UWE) which enables both individual career and organisational capability development; university and business working together to provide mutual support and benefit for future growth.

Overview

A number of reports over the last decade have concentrated on the need to increase engineering skills in the UK in the face of an aging – and, therefore, retiring – population and fewer young people available to fill the skills gaps. For example, the *Perkins Review of Engineering Skills (2013)* makes a key recommendation that: *'Government should invite employers to put forward innovative proposals to develop engineering skills in sectors suffering acute skills shortages'* (p.3), and *'Engineering employers should explore the potential for developing cooperative cross-sector schemes to support postgraduate students'* (p.42).

Similarly, the report Engineering the Future: An Insight into Modern Manufacturing (2014) notes that: *'A recurring theme that was raised by almost all contributors was the challenge of finding skilled workers at all levels'* (p.5)

The changing landscape of university fees impacts on this, as does the climb back to economic prosperity. Much of the impact these will have on the future are unpredictable, so it is important that steps are taken as soon as possible to try to mitigate future shortfalls.

As part of this mitigation, universities need to think beyond traditional teaching and research in their business engagement approach. Different ways of engaging both students and employers are required: both in terms of module delivery and programme design, to meet professional recognition as well as academic accreditation. Organisations are looking for different outcomes to individuals – capability versus career demands.

Organisations need to consider closer involvement with universities, to ensure the graduates they employ continue to have the skills and competencies they require, and also to ensure lifelong learning opportunities support business innovation and sustainability. They should also consider other parts of the workforce with non-academic backgrounds, yet working as advanced professionals. Professional standing is as important for the organisation as for the individual.

Aims of this case study

This case study identifies and explains the rationale for the development of the flexible Engineering Career and Capability Development Framework (ECCDF). This provides flexible and blended learning opportunities for those already in employment, whilst strongly encouraging the close involvement of their employers to ensure the skills acquired meet the organisations' competency requirements. The ECCDF is aimed at using academic learning – content and techniques – to enhance both individuals' careers and organisations' skills and capabilities, to achieve long term professional benefit and recognition, alongside immediate, improved return on investment.

It also aims to enable a long term workforce development 'life cycle', ensuring a continuous learning and development process to meet the demands of economic and demographic variations in the market place.

Background

In the early 1990s, a number of large aerospace organisations approached the University of the West of England and the University of Bristol, requesting a practice-focussed postgraduate award stream. With initial five-year funding support from Engineering and Physical Sciences Research Council (EPSRC) to develop an Integrated Graduate Development Scheme (IGDS) in Aerospace, a programme was designed to provide graduate-level employees with further skills to meet both academic and practice-related competences as required by this engineering sector. Similar initiatives were set up in other sectors, such as the Marine and Nuclear fields (Marine Technology Education Consortium http://www.mtec.ac.uk/ and the Nuclear Technology Education Consortium http://www.ntec.ac.uk/).

Over the next twenty years, the resulting IGDS (Aerospace) became the Continuing Professional Development in Aerospace (CPDA), funded solely by income from business. It provided a wide range of block-delivery learning, on demand, to students across the industry – with all assessment based around embedding their learning within their workplace. This ensured the skills were immediately implemented, whilst also allowing academic reflection and evaluation: benefitting both the student and the sponsoring organisation. It was especially useful for graduate-level employees who did not have a first degree – having achieved their positions through alternative routes, such as apprenticeships including HNC/HND learning.

The success of this programme was high – students were able to aim for PG Certificates, Diplomas and Masters degrees, or simply take a module or two, as suited their personal requirements. Many started to use the CPDA to support their professional recognition applications, such as Chartered Engineer (CEng).

By 2012, with the advent of Higher Apprenticeships, higher university fees and organisations' growing realisation about demographic skills shortages, the CPDA model began to attract interest from other organisations within the advanced engineering sector.

Additionally, the CPDA's flexible learning structure model could be evolved for other award programmes. In 2012, with funding from the Engineering Council and HE-STEM, the Engineering Gateways programme called "The Work-Based Route to Professional Registration" was expanded into the Engineering Career and Capability Development Framework (ECCDF). It offered individuals and organisations alike the chance to 'bespoke' their learning trajectories. The joint aims are to ensure:

- Engineers have the opportunity to develop their skills and evidence their implementation towards their professional qualifications
- Organisations are able to develop their staff with both the generic professional competencies and those specific to the business to achieve the capability they require.

Development of ECCDF

During its development, the dual nature of the ECCDF – meeting individual and organisational requirements – turned into a balance between academic rigour and commercial impact.

Student focus

The Engineering Council funding enabled a masters' route supporting CEng application for individuals who do not have a standard academic background. The aim, to provide a work-based learning MSc to evidence individuals' competencies within their organisations' remit, fitted the CPDA ethos. It was logical to link the two awards.

UWE's MSc Engineering Management was also under consideration at that time. Considered as appealing to home and overseas students alike, it was a short step to identify this award as a similar opportunity to the two described above – to be offered as both flexible learning and with bespoke opportunities for organisations providing students.

This resulted in the concept of the Engineering Career and Capability Development Framework. Students would be offered the opportunity to 'module gather' training courses – with the added advantage of embedding learning via work-based assessment, completed by assignment. Any credit awarded for successful assessment completion could itself be gathered towards awards at postgraduate level.

Key to this is the completion of the 'Professional Development Appraisal' (PDA) module, designed to help the student determine their own career plans against a competency framework – normally UK-SPEC for Engineers. Doing this helps the student to identify the skills they already have and those they are missing; it also makes them consider how to evidence each skill required.

This approach connects the student to his/her preferred professional engineering institution early in their study. This assessment lends itself directly to the Institution's promotion of 'Further Learning Contracts (FLC)', enabling individuals to design their own particular learning path to the required professional qualification, such as CEng. The PDA informs the FLC – and successful completion of the study programme provides evidence for the CEng application.

The ECCDF currently contains four award pathways:
- Professional Engineering
- Engineering Management
- Engineering Operations and Improvement
- Aerospace

All pathways have been endorsed as suitable routes towards Chartered Engineer recognition by the Royal Aeronautical Society and the Institution of Mechanical Engineers. Both have also recognised the MSc Aerospace as an accredited degree towards Chartered Engineer recognition.   In addition, although not yet formally reviewed by the Institution of Engineering and Technology (IET), three students have recently engaged through the ECCDF's PDA module with the IET's 'Learning Contract' process.   Both forms of recognition are vital to make the ECCDF attractive to both applicants and their employers: the route to CEng is a major career goal and provides organisations with formally recognised professional employees.

Students usually have an idea which pathway they prefer when they start, but the PDA module has made a few realise their interests are actually slightly different, with the ECCDF allowing them to target an alternative award, if this becomes more appealing and relevant.

Learning is offered in a variety of formats, blending learning in a range of methods e.g. distance and work-based formats alongside face-to-face learning, to meet the needs of both students and their organisations. Key to a truly successful study path through the ECCDF is this dual approach: students' careers being developed alongside organisational competences and capabilities.

There is also another learning pathway for those who do not need full awards to achieve their competency evidence. Many mid-career individuals have plenty of experience, often some high level academic learning, but a few skills gaps stop them meeting the UK-SPEC criteria: module gathering to achieve those competencies and skills is encouraged via the ECCDF, whether or not an academic award is actually achieved.

Organisation focus
During development, it was realised that the ECCDF had as much to offer organisations as individuals. Its flexibility allows organisations to get involved with their employees' learning in a variety of ways:
- Supporting module choice, to ensure the individuals get the skills needed by the business as well as meeting their personal career goals.
- Providing their own courses to the ECCDF, to be accredited formally by university academic and quality processes – this provides the ECCDF with a wider range of modules for all students than the department can otherwise offer, and incentivises the organisation to:
  o Encourage their own staff to complete both the training and the educational assessment, relating directly to the organisation's business;
  o Link closely to the university, especially when tendering for business;
  o Create/enhance a staff development programme which identifies learning for all staff, integrating the individual's pre-existing academic and experiential learning to achieve professional recognition via a bespoke study plan through the ECCDF.
- Developing their own bespoke award programme within the ECCDF as an extra pathway; focussed on the organisation's specific learning needs, but containing the academic rigour and quality assurance the university can provide.

This focus on the wider needs of the organisation, rather than simply on the individual student, enables the university to offer the ECCDF as one mechanism within the range of business engagement opportunities available – whether it is consultancy, short courses, knowledge transfer partnerships, placements, etc.

The ECCDF provides both:
- Professional Development for the individual
- Organisational Development for the business

Challenges
Universities and businesses have worked together for a long time and are used to a traditional relationship, focussed around university-identified learning programmes. However, the current skills shortage requires both to rethink and redevelop these relationships, to pursue such links to ensure a long term skilled workforce can be sustained. For example, the Universities UK report Masters with a Purpose (2014) notes that:

'Universities should recognise that building effective working partnerships with employers will take time and energy …. and encourage students, employers and institutions to consider Masters degrees as 'degrees with purpose', rather than simply an extension of undergraduate learning' (p.10).

Key to the ECCDF's success is the opportunity for organisations to strongly influence the development of such study programmes for their employees, rather than just sending them on an award programme and waiting for a demonstration of the required skills after successful completion.

Explaining the offer to organisations
Explaining the opportunities for organisational involvement in the programme and eliciting requirements can challenge organisations which have not had to think in these terms before. However, once the benefits are made clear, most have engaged with great enthusiasm.

There are two key aspects: the ability to influence the academic input into workforce development and the partnership opportunities available through working with a university.

The first aspect aims to ensure the organisation understands the flexibility in both learning and delivery available, and how this can be used to influence the development of awards to meet their own needs. This requires the organisation to have its own workforce development strategy and implementation plan, with sufficient personnel in place to enable this plan. Universities can support this process, but it can be difficult to get organisational commitment.

The second aspect is to show how the long term relationship can be utilised to become a valuable contract-tendering advantage: demonstrating a sustainable workforce development programme, producing highly qualified professionals from academically rigorous training programmes.

Working with the professional institutions
Professional institutions exist to ensure standards are created, sustained and improved, as required. Their remit to act as a form of quality assurance for industry/academic relationships is critical to maintenance of standards and professional recognition. The Engineering Council's acknowledgement that professionalism can be found in the varied backgrounds of many practicing engineers is a clear indication that universities need to offer the flexibility to evidence and enhance that professionalism. The challenge is to gain approval from individual professional institutions for non-standard approaches.

University systems
The annual academic cycle does not suit business cycles. Part of the ECCDF's attractiveness is the flexibility of study, to suit individuals' own work-life balance. The study mode allows learning to fit in with the full time role and family life. However, universities' operations and systems are set up to meet the annual cycle, and their focus is not directly on providing graduates for business, but rather to enhance education as a goal in itself.

There are four specific areas that need attention:

Long term investment and leadership
Investment, both in academic personnel and funding, is required to enable this new way of providing learning on a potentially large scale. Time is also required, to achieve organisational understanding and support. Companies have to digest the new opportunities and get their own internal approval before committing to such academic development.

Academic resource and career paths
Academics need to understand the differing requirements of non-standard delivery in comparison to well-understood traditional delivery mechanisms. Resource management is required to provide the opportunities for both. In addition, business-focussed education needs to be clearly identified as career enhancing, or there will be insufficient support forthcoming.

Administrative support
University systems are geared up to higher education timetables and academic processes. These can conflict with the responsiveness needed to meet organisational requirements – either meeting short deadlines, or being able to wait many months for organisations to identify their specific requirements. The organisation-focussed approach requires everything from applications to student records to timetabling and more to be considered in a non-standard way. This needs understanding of the concept not only from academics but also from support personnel across all such functions – administration, marketing, building services, etc. Excellent student – and, therefore, employer – experience is the ultimate goal; this can be problematic to achieve in practice, requiring full reviews of existing systems and processes.

<u>Marketing</u>
Marketing business-to-business can be a challenge for a university, used to the typical undergraduate/postgraduate marketing to individuals. The focus has to shift towards an organisational focus; marketing becomes long term business relationship building. Initially, consideration has to be given to identifying who to target and how: both individuals and organisations. Once identified and preparing material to support contact, the next step is to move from 'here is what we have – use it or lose it' to the flexible approach of 'well, what do you want from us?' The former is much easier to publicise than the latter. Websites and sales material have to be developed to appeal to organisations, from ease of use through to a business rather than individual approach. Once interest has been created, further material is required to support discussions. All of this is much more difficult to do than traditional HE marketing.

Evaluation

An important part of the development of the ECCDF has been to understand how learners and their employers, together with the professional institutions, view the concept; their experiences as participants, and what they believe are its benefits to them. We have evaluated the ECCDF via informal discussions with employers, case studies from students and feedback from the professional institutions. Direct feedback has been from individual employers and the department's Engineering Professional Advisory Board. Further indirect feedback has been via the PDA module assessments which show the high level of student engagement.

The ECCDF is a robust flexible academic programme and, from the evaluation undertaken and feedback received, it appears to satisfy employers' needs once they understand the flexibility it can offer them. Organisations recognise the ECCDF's usefulness in a number of ways, noting:

'…the requirements of businesses are different to those of individuals pursuing Higher Education.'

'Providing part time learning is essential for professionals already balancing work and family commitments.'

'A modular approach is hugely beneficial … provides greater flexibility and enables businesses to commit to certain modules without necessarily committing to funding a full MSc.'

The ability to academically accredit company expert-developed courses is considered *'…a very positive step forward as it satisfies particular customer requirements, whilst opening up individuals to the prospect of going on to complete further modules and achieve a recognised award'.*
(International Advanced Engineering/Aerospace organisation, with a key hub in the South West)

The professional institutions have provided feedback via an accreditation event. Their view was that the ECCDF enabled and benefitted from strong industry links and the focus on satisfying industry needs. In addition, it was commended as an innovative approach to building portfolio qualifications.

Learners value:
* The breadth of technical and business modules:
  'My chosen modules covered many of the technical areas I needed in many of my roles and yet also provided a robust high-level management background which has proved invaluable in quickly understanding and using the widely differing processes and toolsets necessary to function in any modern corporation.' (Graduate, Consultant / Ex-Services)

* Accelerated learning:
  'My organisation received not only value added assignments and case studies from my participation … but they were also provided with an employee with an accelerated level of learning … They now have an employee that is more versatile in their skill set, who is able to take on a variety of roles if needed.' (Graduate, Rolls-Royce)

- The focus on professional recognition:
  '... Provides a valued higher level qualification which can be used to help obtain professional registration with the Engineering Council (UK). … Can result in an increase in the number of employees eligible for professional registration, helping to achieve specific contract requirements.' (Student, AgustaWestland)

To sustain the ECCDF, it has to be seen as useful to the university, both strategically and for individual academic careers. Although developed initially for the postgraduate market, it is being considered for undergraduate courses, too – eventually providing a professionally-focussed learning continuum. However, in order for a framework such as ECCDF to operate, academics have to buy into the approach and be willing to contribute.

It is recognised that traditional university management approaches can limit the effectiveness of academic staff to find capacity in their workload to support this flexible framework:

'The power of the ECCDF is in its focussed but flexible approach. The framework allows the organisation and the employee to strategically align their competencies to best position themselves within rapidly changing commercial environments. Managing this type of programme alongside traditional modes of delivery is not without its challenges; it requires an innovative approach to module delivery to ensure we are able to respond to the needs of the businesses engaged in our programmes'. (Programme Manager, ECCDF)

Different feedback mechanisms, such as an annual survey of students and their sponsors, are under consideration; similar approaches in the past for the Aerospace pathway have been positive, enabling each student to feel part of the education process as well as professionally engaged in their organisation.

Conclusions and next steps

Alongside traditional academic learning pathways, the flexibility of the ECCDF and similar approaches at UWE and other universities provides individuals and organisations alike with an alternative approach to lifelong learning.

Universities cannot rely solely on undergraduate courses as their major source of income – fluctuations in the market make this a necessarily short-term business model. Employability is a critical factor for all graduates – and enabling these graduates to return for further learning to enhance their careers is a sensible approach.

Organisations need to work with universities to ensure a continuous supply of graduates, support and collaboration over new innovations and research, and to ensure lifelong learning. Their own markets also fluctuate – a well-educated and versatile workforce strengthens an organisation's ability to flourish in its sector.

Flexibility, through mechanisms such as the ECCDF, provides both camps with the chance to benefit and be benefitted by the other. Good practice at taught postgraduate level enhances academic learning, which feeds back into undergraduate learning, ensuring high quality teaching. Using those based in industry to provide real case studies and project implementation is as good academically as it is industrially.

However, although the mechanisms are in place, there are two long term battles to be won:
1. Persuading universities to adopt a radical new approach to business engagement; and
2. Persuading organisations they really can have a say in their staff learning and how best to optimise the opportunity.

Most universities are involved in business engagement. Those that are willing to lead in innovative practice and flexible approaches to the customer could reap high dividends. Nevertheless, it is a risky strategy to take, whilst the customer is not yet sure how to make use of its newfound freedom.

Advice
- Invest in the staff, both academic and administrative, including business intelligence, in order to build up the business relationships required.
- Raise the profile across business of the various offerings.
- Be prepared to collaborate with other universities to provide organisations with the full range of learning opportunities required.

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b. Enhancing postgraduate education to support the needs of industry: Delivering a closed MSc course for a consortium of local authorities

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Introduction

There are increasing demands for universities to better support graduates in their move from education to employment and to better support the development of graduate knowledge, leadership and management skills, facilitating succession-planning by harnessing talent and ensuring a pipeline of individuals with the skills to move to more senior roles. This paper describes the challenges and outcomes of one such project undertaken by the University of Brighton to support the development of Highways Engineering Management across the South East Region through a partnership with local authorities and their highways contractors.

Overview

The University of Brighton has long held the belief that all taught programmes at undergraduate and postgraduate level should have clear relevance to the needs of industry: be that to prepare students for working in commercial enterprises, a research environment, or the public sector. This has been achieved typically through close liaison with employers through placements, Industrial Advisory Boards and consultation with relevant employers by programme development teams; but more recently this has led to a focus on the development of novel programmes in partnership with employers to support the translation of graduates from education to employment and support their longer terms development through postgraduate education.

There has always been some conflict between the call for specialist programmes aimed at niche sectors of employment and the need to make programmes attractive to viable cohorts of students. More recently a number of organisations have recognised that a broad undergraduate education is a good starting point on which to build employee development and have approached the university with a view to growing a development stream for existing and future staff. A particularly challenging example is the development of a programme of learning aimed at Highway Engineers within the South East in conjunction with a consortium of seven local authorities and their subcontractors.

The university believes that increasing such engagement with local employers strengthens our regional position; this not only benefits our graduates through enhancing employment opportunities but also enhances the quality of our academic provision. It also supports student recruitment by underpinning our commitment to providing routes to graduate level employment and enhancing opportunities for economic and social engagement through collaborative research, knowledge exchange and knowledge transfer.

The request by Industry

The South East 7 consortium (SE7) approached the University of Brighton about helping to fill a needs gap in the sector. The local authorities had a good quality senior and middle management structure with very able people in position but, with the growing demands in the highway sector, they could not see where the next generation of engineering managers was going to come from unless they were proactive in ensuring a feed through of suitably qualified people. A scoping exercise had already demonstrated the paucity of specialist undergraduate and postgraduate programmes in the Highway Engineering sector and, furthermore, had exposed that content of more generic engineering programmes rarely included much material of direct relevance to the sector.

Early discussions revealed the need for a blend of mainly work-based learning which would include specialist engineering relevant to the highways sector, as well as a significant element of engineering and people management skills. It was also clear that the academic level required was beyond undergraduate level and typically the programme would probably take graduates and develop these to masters' level.

The challenge

The initial consortium comprised 13 organisations: a mixture of local authorities which formed the South East 7 partnership; their sub-contractors who were generally large highways and infrastructure corporate organisations; highway engineering consultancy companies; and the university. Each of the commercial organisations had their own perception of what was required from such a development programme and these tended to be very 'specialist subject' focussed. A few of the representatives had an overarching 'bigger picture' view of the need to educate people so that they were able to solve the problems of the future, rather than just fill today's skill gap, but these were in the minority.

With a few exceptions, the employers had little understanding of educational 'language' (such as the concept of learning outcomes and the contrast of content-focussed learning against developing intellectual capability within the learners), with limited perception of the needs of a masters' level programme, no understanding of learning outcomes and limited knowledge of the wide range of available learning models. Their mind-set was very much around what they saw as gaps in graduate knowledge relevant to their current needs and often this was highly focussed and very detailed. This closely linked with the employers' focus on what they wanted to be included in the programme's content, rather than considering the intellectual capability that they wished to develop within their workforce.

In a number of cases it was not always possible for the consortium members to send the same representatives to the development meetings. This exposed the fact that we were benefitting from personal views rather than agreed corporate views, leading to a concern about acceptability to the consortium organisations and adding the challenge that agreement achieved at one meeting could be overturned at the next. With 13 partners the scope of declared programme requirements was extensive and tended to be content-based. If all the requested content were simply to be included within the programme, it would have been considerably larger than one MSc, even without considering the need to ensure it looked like a cohesive programme of learning. Programme cohesion needed to be assured with a clear thread running through it and it needed to be about development of competence, rather than simply growth of student knowledge.

The journey from having identified a conceptual need within the sector to running a successful MSc was going to be challenging and, as with all these things, a sense of urgency prevailed. Things needed to be kept moving and evidence of progress needed to be clear to ensure that employer commitment was gained and maintained throughout the development of the programme – and to ensure the support of student learning once the programme was running.

The approach adopted in developing the course

It was apparent from very early on that the consortium comprised a set of members that did not have a consistent view of what the programme should deliver. Indeed, while some had a very strong view of what 'must' be included, others were clearly feeling their way and needed to develop their own thinking, both in terms of what their organisations really needed and what might be possible from such a cross-authority (and potentially pan-sector) development. If it were to be successful, the project was going to need a strong, sensitive and neutral lead who could take the consortium from its broad range of individual starting points through to delivering a masters' level programme that was perceived as a success by all the stakeholders. The university was well placed to provide this neutral lead and made available a senior member of staff who had extensive experience of working with commercial organisations and of developing partnership programmes, to work with the consortium from the 'concept' stage right through to 'first delivery'.

A key element to ensuring the success of such a consortium based project is to ensure that all partners feel that they have a voice that is being listened to. Particularly in cases where there is a wide range of strengths of character, it is essential for the process to enable all partners to be included in discussions and decision making. Consequently, an early phase of the project included enabling all parties to 'free flow' both verbally and in written form their 'desires' in terms of the programme. This was usually content-based, though did include some elements more akin to competencies. The result of this was a plethora of lists of content,

some of which had structure, others were more of an unedited random list of 'things people don't know about'. Some of the content was applicable to many areas of highway engineering, some was very specific specialist material relevant to a particular authority department or contractor, and some was written in a form that was about the competence required.

This data-rich information was then taken off-line and worked on by the university to mould it into a shape that might become a programme of learning, grouping together similar subjects and forming elements that might become cohesive modules. This exercise enabled an initial structure to be defined which could be presented to the consortium for discussion and, while clearly being a bottom up design exercise, the university was cognisant of the needs of an MSc programme and of the SE7 global aim of educating its next generation of engineering managers and could work towards these.

This initial shaping work enabled agreement of the broad shape of the programme (with the caveat that it wasn't yet fixed giving comfort on all sides) and facilitated a review of the content requests against what had been included. This led to some modifications relating to content, but also enabled further shape to be added to the structure and some initial work on the development of learning outcomes.

Agreeing the course

The cycle of review with consortium – modify, agree issues, work off-line and review with consortium again – continued and there were several iterations of reshape, merge, consolidate, reflect and review. At all stages all consortium members were kept updated and given the opportunity to feed into the process, either by email, telephone or, preferably, within the regular meetings. About nine months after the initial meeting the consortium arrived at an agreed programme which actually looked like an MSc, complete with programme level learning outcomes and a full set of module descriptors. Again, it was noted that caveats needed to be expressed explicitly to enable this in that we would be able to review and change things once the programme was up and running, and indeed we would be expected to reflect and evolve as necessary.

Having agreed what it was that students would be able to do by the end of the programme, the next key step was to design and articulate the support structures and documentation to support the learning models that had been discussed during the development work. This included mentor and tutor specifications, study patterns, learning environments, and the intensive study week model (see below). This stage was considerably more straightforward than agreeing learning outcomes and content, as it was possible to utilise most of the ideas generated by the consortium; it was notable that this was a very positive phase in the development.

Having an abundance of material in varying states of refinement, from telephone notes to 90% complete module descriptors, it was now necessary to collate and refine this in order to develop the documentation for validation. Again, this was an off-line activity undertaken primarily by the university, but it was critical to ensure that the consortium did not lose interest during this bureaucracy-dominant stage as their review, support and agreement was imperative. This was facilitated by maintaining very short time-lines and by highlighting all elements that had changed, rather than putting readers to sleep by getting them to review documents they had seen previously.

With a very real prospect of having a fully validated MSc programme ready to run, recruitment became the next urgent imperative. The approach towards this was multifaceted, with the initial cohort to be sourced from existing employees within the consortium and later cohorts to be sourced externally, with successful applicants becoming employees of the organisations. A maximum cohort of 16 was targeted, with the spread of student numbers across the companies being agreed. One issue that arose here was the timescales incurred within budget and training cycles within the local authorities and the limited flexibility to move things around at short notice. Some of the consortium were more able to be flexible than others, but this resulted in those who had been more closely involved with the development (and hence being more aware of the reality of the MSc) being in a better position to facilitate the student application and selection processes. Although timelines were squeezed during this phase, recruitment was achieved and so it was on the next challenge – to deliver!

The learning model, structure and delivery of the course

The programme follows a nominal two-year cycle and matches traditional MSc programmes in that there are 120 'taught' credits followed by a 60-credit project. Initially there were two models of study with modules being taken at different times, but this flexibility was reduced after the first cohort due to the additional workload incurred by the course team in supporting this (duplicate assessment etc.). Similarly, it had been planned to have two intakes to the programme each year but, once more than one cohort was in place, the complexities of having students at a wide range of study points created significant additional resource demands in terms of providing suitable intensive week content (see below), assessment and support. This was deemed to be unsustainable, given that few of the consortium had benefitted from release from other duties to support the programme. An example initial study programme is shown in Figure 1 and demonstrates the 'long thin' nature of most modules and the timing of the intensive weeks.

Figure 1   A typical programme of study including credit allocation for each module (xx) and nominal timing of the intensive study weeks (IW).

The majority of the learning is work-based, with the students being supported by a work place mentor as well as a university tutor. The learning is also supported by a series of intensive weeks spent at the university, three of these being held each year. These are a blend of strategic context-setting, study support and targeted technical sessions. Written and viva-voce examinations also occur during these weeks. An example intensive week schedule is shown in Figure 2. This example includes viva-voce examinations for one module (CNM74, Highway Asset Management and Engineering), a series of lectures and seminars, and a group exercise based on a given scenario which runs throughout the week.

Figure 2   Example of an intensive week of study (3 a year)

The students

To date, students have been existing employees of the local authorities or their contactors. They have had varying amounts of experience and work in a wide variety of roles. The age range is wide, varying from those who have graduated and joined the authority within the past few years through to mature engineers who have a long employment history but have been out of formal education for a considerable period. This diversity brings both benefits and challenges. Although the students work for different employers and hence do not normally work together, they quickly developed a sense of cohort identity, enhanced by the activity in the intensive weeks, and by bringing them together in a supported way within action-learning sets to facilitate further their learning environment.

A key aspect has been to develop the students as independent learners, while ensuring that they benefit from their fellow students, company mentors, work colleagues and the support available from the university. This has been a careful balance and has required a separate strand of education in terms of understanding what the programme is looking for, e.g. understanding the language of learning outcomes and assessment criteria, the difference between shared learning and collusion, and the ways in which the meeting of learning outcomes might be demonstrated. Mentor training has been a key aspect to ensure local day-to-day support of the students. Mentors are senior staff from the student's organisation and usually are not their line manager. To ensure that the mentors can do their job successfully it has been essential for them to be trained so that they have a sound understanding of the programme, its aims, the demands on the students and the nature of the assessment. They also need to understand the relationship between their role, that of the student's line manager, and that of the university. Training events for mentors have been run jointly by the consortium and ongoing support for mentors has been made available.

Development and delivery

It was very quickly apparent that this development would be particularly challenging, in that there was an expectation by each of the consortium that their specific needs would be met by the programme but that there was a very diverse range of needs. At the most abstract level, there was significant conflict relating to the emphasis of the programme and it took considerable effort to establish agreement on the balance between technical and managerial content. Given the previously-cited challenges of representatives bringing personal views rather than corporate ones, where necessary key elements such as this were referred back to more senior officials within the consortium organisations; this was essential to unlock such critical decision making points.

The dealing with the diversity of requirements has been discussed above and the process generally worked well. Few discussions were simply about "do we include it or not", but were more focussed on reflecting on what it was that was really needed and the way in which specific specialist content could be included in a broader set of learning outcomes and through using more encompassing language within the content descriptions.

During the development phase the project team drove things hard to reach an agreed programme of study and successful validation. However, as the programme took shape, validation approached and the programme was moving into the recruitment phase, it was necessary to embed the programme into the university structure and make the transition from fast-track development to 'business as usual'. To aid this a Course Leader from the relevant academic area was agreed and started to work with the development team. Unfortunately, the nominated person did not display the same level of energy and enthusiasm as the development team and a number of issues occurred before the extent of the problem was realised. It took a change of course leader to resolve this and, in the interim, the university development leader remained closely associated with the programme and took a significantly higher profile role than had originally been intended. This had the benefit of ensuring that the students were well supported, but did on occasion result in some significant fire-fighting activity by others in the consortium to ensure that things were delivered on time and at the appropriate standard.

The programme was developed with core foci being the needs of the consortium and the prospective students and significant work was undertaken to ensure an optimum learning model for the students who would also be working full time. This resulted in a flexible model built around the local authority calendar, with academic terms and semesters taking secondary priority. With growing pressures on the HE sector and an ever-increasing need for efficacy and fit with existing administrative structures, the programme timetable has been modified to enable standard administrative procedures to be utilised without disadvantaging the students, though it is noted in some cases university staff have needed to reflect on their rather rigid stance.

The majority of the representatives within the consortium are involved with the programme in addition to their normal duties. This is not an unusual situation when working with commercial enterprises, but is particularly problematic when periods of high-intensity activity (e.g. when it snowed and many roads were closed creating a large peak in work load) coincide with a period of high demand from the programme. The team has tried to maintain maximum flexibility and all parties have gone to great extremes to ensure that delivery has occurred as required, though not surprisingly this has often had a cascade effect and required others to react very quickly to ensure student experience has not been jeopardised.

The premise underpinning work-based learning is often misconstrued to be about simply learning by doing. In most cases this is not the situation; students are required to do additional work to ensure that they develop the understanding of the wider context surrounding their role, as well as understanding the underpinning knowledge behind their work. It is also necessary for them to become 'reflective practitioners' and, consequently, become part of a cycle of continuous improvement. This ideal scenario often conflicts with the commercial need to deliver a job and move on to the next deadline, and it has been essential that students receive support to manage this from the university, their workplace mentors and their line managers. One of the key steps taken is to ensure that not only are the students committed to the additional work and change of approach, but also that their immediate managers and mentors are too. Students have always been made explicitly aware of the challenges and training for mentors has been imperative as often they are the first to become aware of any such problems. While there have been challenges in this arena, it has been managed successfully to date and although it has been a contributing factor to a number of students who have suspended their studies, it has usually been exacerbated by external personal circumstances.

Commitment to deliver

Commitment from the consortium to the development was variable and there has been an imbalance of contribution both during the development phase and within the subsequent delivery and support. A number of organisations were fully committed, were always represented, and were always constructive in their approach; others were less so, but still wanted to ensure that the programme would benefit them in an optimal way. During the development phase, steps were taken to ensure that consortium members could contribute through a range of mechanisms, particularly if people were unable to attend the regular meetings. These included dialling in to meetings, e-mail reviews of documentations, 1-2-1 telephone discussions and ad-hoc meetings at more convenient times and locations for those unable to attend at set times.

Since the programme has been running, there is a clear expectation that if an organisation wishes to have students on the programme then they are expected to contribute to the running of it. This can be through being involved in the intensive weeks, contributing to assessment, or providing other support to the cohort. All companies with students on the programme must provide mentors for their students. As the programme has developed this has been less of an issue as the programme has become a reality and a better understanding of the reasons for reluctance has been gained. This has enabled targeted training and coaching to be provided and all parties have gained benefit from this.

Conclusions

An MSc which meets the needs of the local authority highway sector in the South East has been developed successfully and is now being delivered through a consortium managed by the University of Brighton. The process of programme development had significant challenges but, through a shared ambition to succeed and through appropriately focussed effort, cohort three is now studying on the programme.

We have a two year MSc which is a work-based model, supported by three intensive weeks at the university each year, comprising of a blend of subjects which range from core highway engineering theory, through to the softer skills of managing and optimising performance.

The initial timescale from agreeing the concept of developing a collaborative MSc to programme validation was 12 months. The challenges of reaching consensus confounded this and as a result the initial cohort started in the February after the targeted October. This delay was apparent very early in the development process and, as such, there was little impact on learners, given that promotion only commenced once there was confidence that the programme would be ready to run.

The consortium members evolve as time progresses, with people changing roles, local authority contractors changing, and new partners joining and supporting the team. This is perceived as a positive development, enabling fresh views and an evolving programme which can continue to meet the needs of the sector.

To date, the programme has yet to move to the originally-proposed second phase of direct graduate recruitment but continues to recruit from existing employees. The programme is successful and has recently modified its title to reflect the weight of the management aspects within its content.

The additional workload of studying an MSc is significant and awareness of this is important. Even though it is a work-based learning programme, this does not mean that nothing is required outside of work. There has been some attrition during the programme, but most cases have been because an external unforeseen factor has arisen and the student has already been at capacity studying for the MSc in parallel with meeting the demands of a challenging and fast moving career. There have now been two successful graduating cohorts.

Recommendations

- Invest significant effort in developing a shared understanding of all the stakeholders, not only from the perspective of what they think they want from the development but to understand their comprehension of the education system and what it is likely to be able to deliver. Ensure that time is available to bring all parties to a sufficient level of understanding of all aspects before attempting to move into the programme design phase.
- As academic partner, make sure that you take the responsibility for managing the development and validation process, for educating the stakeholders and for managing the diverse range of intra-partnership relationships.
- Accept that it will not be a unidirectional path forward but that iterations, revisions and significant re-writing will be necessary.
- Accept that commercial partners may see the development and validation process as overly bureaucratic and burdensome but, while trying to reduce this burden upon them, do not fall into the trap of allowing them to disengage from the process.
- Take the opportunity to embrace the learning opportunity for yourself; such partnership working offers many opportunities to grow long term partnerships and to broaden one's own understanding of the associated commercial sector.
- Remember that successful validation is a milestone and the start of the real journey, even though it may be the end of your project; handover to the ongoing delivery and management team is a key aspect which is at risk of being overlooked amongst the celebrations of 'success'!

6. Opinion

a. The future of STEM PGT study in HE

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Introduction
Global growth of higher education means that to facilitate employment at the right level, students are likely to need postgraduate rather than just undergraduate qualifications. An undergraduate degree provides a baseline qualification, assuring employers of a minimal standard of achievement, but increasingly employers seek graduates with advanced skills and capabilities to enable them swiftly to enter the workplace and genuinely contribute to the business as early as possible. The 'Postgraduate Taught Experience Survey' run by the UK Higher Education Academy (Millen, 2012) indicates that at least 62% of their respondents regard improvement of employment prospects as a key motivation for undertaking postgraduate study. On vocationally-orientated programmes, authentic assignments that related to real world tasks tend to be highly prized by students and employers alike (QAA, 2010, Wharton, 2003). This article sets out to explore how universities can work in partnership with employers to help ensure that those completing masters' programmes emerge appropriately prepared to work within teams at a suitable level.

Universities want to provide employable graduates
National quality agencies, for example the UK Quality Assurance Agency, clearly set out their expectations in terms of what they expect of graduates from masters' programmes. *Inter alia*, they expect graduates of QAA-accredited M-level programmes typically to have:
- 'subject-specific attributes;
- an in-depth knowledge and understanding of the discipline informed by current scholarship and research, including a critical awareness of current issues and developments in the subject;
- the ability to study independently in the subject the ability to use a range of techniques and research methods applicable to advanced scholarship in the subject'. (Quality Assurance Agency, 2010, p.12)

as well as generic attributes (including skills relevant to an employment setting) together with a range of generic abilities and skills that include the ability to:
- 'use initiative and take responsibility;
- solve problems in creative and innovative ways;
- make decisions in challenging situations;
- continue to learn independently and to develop professionally, including the ability to pursue further research where appropriate;
- communicate effectively, with colleagues and a wider audience, in a variety of media'. (QAA, *op cit*, p.12)

The Scottish descriptors are even more helpful in describing the characteristic outcomes of masters' degrees in Scotland as including:

i. 'A systematic understanding of knowledge, and a critical awareness of current problems and/or new insights, much of which is at, or informed by, the forefront of their academic discipline, field of study, or area of professional practice.

ii. A comprehensive understanding of techniques applicable to their own research or advanced scholarship.

iii. Originality in the application of knowledge, together with a practical understanding of how established techniques of research and enquiry are used to create and interpret knowledge in the discipline.

iv. Conceptual understanding that enables the student:
- to evaluate critically current research and advanced scholarship in the discipline; and
- to evaluate methodologies and develop critiques of them and, where appropriate, to propose new hypotheses' (QAA *op cit* p.17).

Furthermore, they propose that typically holders of M-level qualifications will be able to:
- 'deal with complex issues both systematically and creatively, make sound judgements in the absence of complete data, and communicate their conclusions clearly to specialist and non-specialist audiences;
- demonstrate self-direction and originality in tackling and solving problems, and act autonomously in planning and implementing tasks at a professional or equivalent level;
- continue to advance their knowledge and understanding, and develop new skills to a high level; and will have:
- the qualities and transferable skills necessary for employment requiring: (i) the exercise of initiative and personal responsibility; (ii) decision-making in complex and unpredictable situations; and (iii) the independent learning ability required for continuing professional development.' (QAA *op cit* p.17-18).

It is not always clear however that universities are able to ensure that such knowledge and capabilities are evidenced within postgraduate students' profiles.

Employers want universities to provide relevant and appropriate curricula

Unfortunately, employers are not always impressed with the work-readiness of new graduates, particularly those who have been taught and assessed in conventional ways. Arriving with a sound body of knowledge is, of course, expected, but more than that, graduates need to be able to demonstrate interpersonal skills and social literacy, as well as a commitment to ongoing personal and professional development.

> '*In an increasingly globalised world, businesses are looking for excellent graduates with international experience while at the same time attracting lifelong learners with appropriate working experience and state-of-the-art knowledge and skills'* (Rienties et.al, 2012:130)

At least in part to counter such concerns, a major initiative, 'Job Ready', explored between 2012 and 2014 how universities and businesses could best work together to create opportunities for UK students and graduates to develop their skills. Based upon extensive and in-depth interviews with 50 employers, it captures a snapshot of the 21,000 interactions between businesses and University Alliance universities (University Alliance, 2014).

Within the report, Libby Hackett, Chief Executive of University Alliance, said: '*At a time when most of the employment growth in the UK is in [jobs] involving analytical, problem solving and complex communications, it is important that we ensure universities are working closely with employers'.*

The initiative aimed to highlight how such partnerships could help all stakeholders. For example, Annalise Hayward of IBM working with Kingston University said '*We wanted to align with a university that is being strategic and innovative in what it's doing and looking at ways to grow the employability of their students. This mission fits with our values on innovation'* (University Alliance, *op cit,* 2014).

Bill Kelly of British Airways working with University of South Wales said '*To ensure our long-term prosperity and to ensure that we will be able to provide a competitive maintenance service back to our airline into the future (the next 10, 15, 20 years) we needed to transform our skills and experience. For example, simple things like the way we conduct repairs to the aircraft and the challenges around things like fibre optics, avionics, hydraulics, that's all moved forwards from a technological standpoint and we really needed to sit back and ask how we prepare our engineers'*.

Similarly, David Webber, Business Development Manager for AgustaWestland working with Plymouth University, said: *'I expect students to come in highly motivated, energetic and with a very good core base of up-to-date skills in terms of technology, computing and presentation skills. I also expect them to come with an enquiring mind because all of those skills are immediately applicable to the roles we put them into. After this, it's the task specific knowledge that we are looking to provide for them. We're looking for self-starters really.'*

Rhys Williams of GE Aviation working with University of South Wales *'For us to maintain our competitive advantage, we need to be finding and nurturing talent to develop a future pipeline of highly skilled employees'*.

Students want to be employable when they graduate

Many students on M-level programmes are self-funded so, having made an investment in their own personal and professional development, they are likely to have high expectations of the usefulness and relevance of their programmes and, particularly, the means by which they are assessed. Since so many are regarding M-level study as a career advancement or progression route, they are likely to regard as a poor investment of their time and energy programmes which do not add value to their capabilities and knowledge as perceived by potential employers. For this and other reasons discussed above, significant curriculum re-engineering may be necessary within universities.

Designing masters' programmes to satisfy these needs

Good curriculum and assessment design is imperative to enhance recruitment and success rates and programmes which use authentic and valid assessments are likely to be well regarded by students, employers and quality scrutineers.

Students will need well-honed assessment literacies to help them achieve the standards required, since they are likely to encounter assignments and assessed activities very different from those they have encountered at undergraduate level. Many would argue that the key to assuring the employability of graduates entering the professions, including engineering, is to use authentic assessment processes (Brown, 2015). Authentic assessment connects learning experiences to real-life needs and tests skills and competences described in the learning outcomes in genuine rather than proxy ways. Students are required to demonstrate and use their knowledge and skills rather than just write about them. Authentic learning opportunities and assessment tasks are highly prized by students as evidenced in, for example, the Post Graduate Experience Survey (Millen, op cit 2012), and employers welcome the 'can-do' attitude that ensues.

Creative masters level assignments can enrich programmes, engage students and reduce the likelihood of drop-out, which tends to be higher for students studying alongside paid employment. It is of course necessary to consider carefully how comparability of diverse assessment methods can be assured and that criteria are applied consistently and fairly. Our respondents suggested that returning regularly to the specified learning outcomes and ensuring that assignments constructively aligned with these (Biggs, 2003) was therefore highly important.

The Assimilate masters' level assessment project

Contributing to research on authentic masters' level assessment, the Assimilate project was a three-year UK National Teaching Fellowship project (Brown, et al, 2012) which explored innovative masters' level assessment in the UK and six other nations. The research team found that while most masters' programmes use traditional assessment methods (unseen time-constrained exams, reports, essays, dissertations, case studies) there is considerable innovative assessment practice in use, including assignments where employers are engaged in the design and delivery of assessment and highly authentic methods and approaches where employability was specifically addressed.

Social and interpersonal literacies must also be central to taught postgraduate courses, since employers tend to value above almost anything else the ability of their employees to work cooperatively in teams, to solve problems and communicate effectively. On traditionally-delivered and assessed programmes, high levels of dependency on lecturer inputs could become learned behaviours, but where autonomy is pedagogic practice is progressively developed through scaffolded learning experience, graduates are more likely to become autonomous and confident in their own capabilities. Students lacking self-efficacy (Dweck, 2000) and resilience (Poole and Lefever,2009) are unlikely to be confident and capable employees, even though their marks in exams and projects may be high. Hence, assignments that foster effective team work and group activity alongside the ability to demonstrate emotional intelligence (Mortiboys) can be particularly valuable to employers, as Assimilate project interviewers found.

An MSc in Marketing Communication at Bedfordshire University has a strong focus on employability and includes within its cohorts a number of international students. Assignments include group tasks, but each student also has to produce an individual development portfolio including industry-standard diagnostic tests as used in the advertising industry, promotional podcasts and personal reflections; peer assessment is widely used. Some assignments are peer assessed and an assignment close to the end of the course requires students to 'sell themselves' as if at a job interview, a skill highly rated in creative industries.

At Cranfield University a number of 'Manufacturing Masters' programmes are offered where assessment requires students to learn in groups of 4-8, with live clients on authentic tasks. The ability to engage effectively with team work was seen by many Assimilate respondents as crucial for employability. Outputs at Cranfield include project reports, posters, presentations, and other features, for example, Lego models of new factory layouts, and employers and clients are involved in the assessment. Presentations are high profile and given to audiences sometimes exceeding 100 peers, academics and representatives from industry and commerce, providing a highly authentic competitive environment.

The ability for postgraduates to demonstrate information and digital literacies is likely to be paramount in an age when 'knowing how', 'knowing why' and 'knowing where to find an answer' are likely to be just as important as 'knowing what'. Crucial in this era is the ability to locate and sort information, and knowing what sources, like peer-reviewed published research, are trustworthy, and which, like peer-generated content sites, for example, Wikipedia, are not. Equally, being able to locate relevant and current data within a morass of sometimes competing information is a core skill graduates and their employers are likely to value highly. Much of what undergraduate and postgraduate engineering students learn can date rapidly in fast-changing technical environments, hence the focus on twenty-first century information management skills rather than mere recall of long-ago learned content.

There are strong arguments for the integration of industry-standard training within degree programmes to support employment readiness in such areas as use of specialist software for example, for example in vendor-accredited accountancy packages (e.g. from Sage) and project management (e.g. Prince). However, the decision-making process to select what training to include needs to be undertaken in conjunction with employers, and it is important that such packages be regularly reviewed to check currency and ongoing relevance. There are likely to be cost issues for universities in such arrangements, but any investment is likely to have pay-off in terms of student engagement and satisfaction, as well as employability for graduates. With students in the UK at least nowadays paying higher fees, they are likely in any case to have higher expectations of what degrees might contain as standard rather than as an add-on subsequent package.

The role of employers in working with higher education institutions to produce good quality post-graduates is important in other ways too. Academics teaching on programmes may be some distance from their own professional work experience, hence the need to seek and take advice from those currently engaged in the field, not only on what is taught and how it is taught, but also on how it is assessed. Employers need to have a presence in course design and development, validation of new courses, periodic review of existing courses, evaluation of the student experience and commenting on such issues as specialised pathways and the kinds of optional modules available to students. Even though professional bodies take a keen interest in all of these areas, it is extremely helpful to obtain first-hand commentary from employers to inform decisions that can make the differences between students being attractive to employers and having trouble finding employment at the right level for their awards.

One of the troubles experienced by all stakeholders is the difficulty universities have in originating learning programmes that meet employers' needs within very short timescales. There is a necessary balance to be held between the desire to be rapidly responsive to educational market needs and to follow due processes that assure the quality and standards of the awards under development. Many of the problems UK and international higher education providers experience in terms of, for example, limited confidence by national quality assurance agencies in educational provision stem from over-zealous academics' efforts to short-circuit what they regard as excessive red tape in their haste to provide courses that meet current and future employers' needs. Quality assurance processes tend to grind exceedingly slowly, with resultant annoyance for employers who can't understand why validation of a programme can take months or even years. There is a need for university Registry staff to be both realistic and permanently conscious of the high reputational risks involved and to conduct matters with due probity in alignment with professional body requirements and governmental imperatives. Busy registries may be dealing with multiple demands from staff across the university to take new programmes through validation, and this can be frustrating for both academics and external stakeholders keen to progress matters at faster than glacial speed.

Conclusions

It is impossible to predict the future of postgraduate STEM education or indeed to fully future-proof higher education curriculum design and delivery. Few would have accurately predicted the rapid movement towards the provision of Massive Open Online Courses (MOOCs) and those who did probably exaggerated their impact, since MOOCs are very efficient at one-way delivery of content and not so effective at fostering meaningful engagement or pragmatic ways of recognising and accrediting achievement on a massive scale. MOOCs only really are convincing to those who have a paradigm of university learning that is premised on an instructional model, rather than one in which students are seen as partners in learning. Many commentators have been predicting for some time the imminent demise of the role of academics working in individual universities, but those who do neglect student evaluations which suggest that personalised learning is valued highly by students at all levels. For me the future role of universities lies in two principal domains: accrediting and recognising achievement, capability and knowledge where-so-ever it has been achieved, and fostering engagement with the learning process (Brown 2014). The STEM professions are likely to need for a considerable period people who can work with incomplete contextual knowledge, use their own initiative to solve problems, act confidently in rapidly changing environments and work within and lead teams who don't always behave predictably and reliably. Their postgraduate education must prepare them for this, and universities need to rise to the challenge to produce such individuals.

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b. Hidden Champions –SME Business leaders of the future
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Introduction
There can be no debate that education is a vital part of our development as a society and economy, but has the higher education content been adapted effectively to facilitate such endeavours? Small and medium size enterprises (SMEs) in the UK represent 99.9% of all businesses, provide 60% of all private sector jobs, employ 14.4 million people and have a combined turnover that accounts for 47% of the overall economy (FSB, 2015). Small and medium sized businesses are often overlooked by policy makers and as such, I feel that SME's are not able to reach their full potential and drive forward the economy and the enrichment of society.

Many commentators put Germany's economic strength down to the Mittlestrand companies which are small, generally family-run businesses that have long term business plans and are referred to as the 'hidden champions'. These Mittlestrand companies work closely with universities and researchers which cluster themselves around larger manufacturers. Once technical excellence of their product has been achieved, then they expand that product into the global market on a longer term basis. By working with the HE establishments, graduates find that they have a rewarding job since they are more involved in critical work processes, have scope for entrepreneurial ideas and participate in all business hierarchies which would not be the case with larger companies. This being the case the Mittlestrand is always evolving and securing its legacy, unlike its SME counterparts in the UK where the future companies' leaders are not emerging from within the SME. The irony is that the wage potential in smaller companies is higher than in those that are larger.

Challenges for UK higher education
The challenge for UK higher education is how to morph and adapt to the requirements of hidden champions in the UK, rather than focusing on the low hanging fruit that are the large companies. The challenge can be broken down into 4 distinct issues:
1. Technical and real world experience;
2. Managing expectations;
3. Retention in SMEs;
4. Industry projects and relationships between HE and employers.

Technical and real world experience accelerates a postgraduate into the company and can increase employability, yet there are a number of issues that need to be addressed. Currently, many PG have a narrow field of understanding with their specialisation, and in many instances have not had access to industry-standard equipment and technology. For example, this might be a CAD system, SAP, Sage accounting or MRP system. As such it would be worth considering modules that include vendor-based training and have real value in the market to an employer and add value if the organisation does not currently use the latest systems. To mould a hidden champion leader there also needs to be emphasis on non-technical aspects such as: finance, commercial and employment law, HSE, industrial psychology and organisation behaviour, to name a few. All of these are well within the scope of the university deliverable. Furthermore, universities are always striving for technological improvement, but it is also important that old technology continues to be taught (where relevant) with the new since this is what could be encountered in the real world environment. Just because it is old technology does not mean it's obsolete.

Managing expectations of postgraduates is a critical issue for SMEs, unlike the larger companies. Common complaints from smaller companies about postgraduates is that the practical skill base is weak and they do not want to accept grass roots training which is seen to be below their own vision of what they should be doing. On the other hand, many over-qualified postgraduates will apply for, and take, any job to gain experience to catapult them into the job market. Consequently, this creates retention problems for SMEs and can create reticence in employing postgraduates in the future. Although the postgraduate will learn the all-important soft skills, they need to understand that their learning has just begun. Placements within

SMEs should be sought by higher education at postgraduate level to give valuable pre-objective training as would have been found with integrated degrees.

So far we have discussed the first three issues cited at the beginning of the discussion, and this leads to the final and pivotal issue which is industry projects and relationships between HE and employers. Traditionally, the vocational aspects of education would have been through polytechnics and day release or 'thick sandwich' courses, with universities being considered for higher level education and research. These institutions by their very mode of operation would forge links with SME businesses and be seen as a vital part of training for an SME. Yet the landscape has changed considerably, and the links that were so easy and numerous for the vocational education institutions are more difficult for universities to attain. The common link today is the student or graduate. One of the major complaints from smaller companies is that there is a disconnect between industry and academic culture, including speed of communication, time to develop collaborative projects and commercial commitments. A confusing aspect of many HE establishments is their perceived purpose: are they educators, consultants or innovation hubs for industries with a bewildering number of different schemes on tap?   The challenge that faces the university is that of creating the bridge with the SME.

The bridge
The solution requires the current circle to be broken and a bridge to be built between postgraduate, higher education and the employer. This starts with developing higher education courses as previously described to make them more relevant to the SME, with pre-objective training and a basket of real life skills, which will produce postgraduates that the SME wants and needs to meet their skill and business requirements.

The postgraduate should then be able to have influence in the SME, by the very nature of its size, on their participation, on work place training and research project opportunities. This can result in the employment of further postgraduates and thus the cycle starts and should perpetuate continual improvement. The bridge also entails higher education institutions proactively to go out and forge links and relationships with business and industry.

For example, my company KPM Marine is a world leader in marine systems and, as a result, I am invited to lecture at universities all over Europe (including Genoa, Chalmers, Piri Ries and Cadiz to name a few) yet none in the UK, even though it has been offered. This activity forges links between the HE institution and the SME; employers will take further postgraduates from and place research projects with the institution, while this joint learning can evolve and develop the HE course thus satisfying both the stakeholders.

Conclusion
If HE institutions in the UK take on the challenge of creating a common bridge through the development of broader skills, the outcome will be twofold. Firstly, the postgraduate student and employer experience will improve. Secondly, it will also be pivotal in exposing the powerhouse that is Hidden Champions, creating SME business leaders of the future that will lead to economic prosperity of both SMEs and HE institutions, thus securing a legacy.

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7. Summary

The main Postgraduate Experience Project report showed that universities want to provide employable graduates, employers want universities to provide relevant and appropriate curricula and students want to be employable when they graduate. These findings are reinforced in the papers presented in this guide. The challenge for the higher education sector, in an environment of reduced funding and declining student numbers, is how postgraduate education evolves to take account of all stakeholders' needs.

If the postgraduate market is to move forward it will require institutions to ask challenging questions: what is the purpose of PGT study? Is it primarily to provide an educated workforce, be a feeder into doctoral and academic study or be a business that generates a substantial amount of money for the UK economy?

Tackling these difficult questions and issues from all directions by identifying interlinked themed areas is a logical way forward. The practical initiatives and papers contained in this Good Practice Guide have generated four key themes:

1. Collaboration

Many of the papers highlight the importance of collaboration, specifically the value to be gained from collaboration between higher education and business and industry.

Several of the contributors focused on the role of collaboration in improving employability for both the student and the employer. For example, Mark Jones, Andrew Lloyd and Jason Russell talk about the benefits of collaborating with the local authority highway sector in the South East to develop an MSc, which has proven to be very successful for all stakeholders. However, they point out that they had to overcome significant challenges during the process of programme development. Their practical advice for collaboration include: investing sufficient time and resources into any development; accepting that any development will not be linear; and identifying opportunities to embrace change.

Wendy Fowles-Sweet and her colleagues write about the development of a flexible PG framework which integrates employer and employee skills and competencies. They highlight in their paper that, although universities and businesses have worked together for a long time, their collaboration has tended to be a traditional relationship focussed around university-identified learning programmes. However, they argue that the current skills shortage requires higher education institutions and business and industry to rethink and redevelop their relationship so that a skilled workforce can be ensured in the long term. This approach is mirrored in the opinion pieces by Sally Brown and Michelle Morgan on the future of STEM PGT study in HE and in Jules Morgan's on Hidden Champions. Richard Allerton adds further weight to the support for collaboration by advocating a matching of industrial competences to academic learning outcomes.

2. Integration of knowledge and skills

The importance of integrating skills and knowledge in the curriculum was highlighted as a key theme by many of the contributors. Driven by the desire for postgraduate students to improve their employment prospects, many of the good practice initiatives include ways of developing desirable skills and specialist knowledge.

At Teesside University, Di Nutt and Paul Britton explain how their skills workshops have been developed to support data analysis and dissertation writing to aid learning and, simultaneously, improve skills valued by employers. David Lambrick from Manchester Metropolitan University provides a practical example of on-line skills support which encourages students to reflect on their skills and experience, an approach advocated by Deborah Anderson in her piece on embedding employability in the postgraduate curriculum. Janet Cole and Nicholas Fernando give a useful overview of a phased, embedded approach to skills training in conjunction with an external training provider, ensuring that students have opportunities to leave their course work-ready. The practical initiatives developed at Lincoln University by Helen Zulch, Sandy Willmott,

Enrico Ferrari and James Flint demonstrate the value of using technology in the classroom for learning and skill acquisition, as well as its transferability value into the workplace.

3. Individualised support for students

Many of the contributors emphasise the need to provide tailored support and communication channels for individual students. Chapter 3 highlights several creative ideas generated as a result of the PEP project for providing tailored support (on-line and face-to-face), during the application phase and the course itself.

At the University of Brighton, Rachel Bowden explains how their 'contact strategy' is providing targeted information to students. Debby Cotton and Karen Gresty at Plymouth University illustrate how key contact information for support services is now provided via a simple credit-card style format. Carolyne Jacobs from the University of Portsmouth describes how the Prep-up web pages are now providing generic university and course information as well as more personalised support and opportunities for students to link socially with others on the course. StudentFunder's Juan Guerra suggests that tailored financial support in the form of student loans can encourage and enable participation at postgraduate level study.

4. The value of research-led initiatives to improve the student experience

The Postgraduate Experience Project has demonstrated how on-going research-led initiatives can make a vast difference to the student experience. The importance of this was also highlighted in Fiona Charnley and Sue Impey's paper, where they suggest that this is one of three action points that are essential in revolutionising how the sector improves postgraduate education in the future.

The PEP project highlights how research can help target limited resources effectively, especially when piloting an initiative. Despite the project's modest funding levels for practical initiatives, it has been possible to trial a diverse range of approaches and share good practice across the sector. For example, issues raised during the focus group stage of the project at Plymouth resulted in improvements to the social space available to postgraduate students, providing a very tangible impact on the student experience for a modest outlay. Many of the improved communication channels and newly-developed information sources are a direct outcome of the initial research phase. The creativity and opportunity to try out new approaches in a context in which results can be disseminated and implemented across several institutions has been a strong feature of the project and one worth emulating in future work.

Conclusion

The key recommendations and advice from the contributors listed below are aimed at supporting colleagues develop policy and strategy within their institutions to improve, adapt and evolve the postgraduate student experience and for those wanting to develop better engagement with employers.

Key recommendations and advice from the contributors for universities

- Understand all stakeholders' expectations, experiences and requirements;
- Universities need to rethink and redevelop their relationships with business and industry;
- Develop a Postgraduate Education Road Map that effectively links business and industry with curriculum development, employability and research and development;
- Effective collaboration between different university units within an institution in developing and embedding employability within learning and teaching;
- More collaboration between universities and business and industry in developing new courses;
- Actively engaging employers in identifying and developing tangible and intangible skills and attributes within the curriculum;
- Support students in recognising these skills and attributes and enable them to articulate them for future employers;
- Identify and reduce institutional bureaucratic and burdensome processes preventing effective collaboration with employers;
- Embrace learning opportunities with business and industry and increase HE understanding of the associated commercial sector;
- Recognise the importance of the small business and the power that is the 'hidden champion'.

The Postgraduate Experience Project (PEP)
collaborative university partners:

Kingston University (lead university)
University of Brighton
Coventry University
The University of Edinburgh
University of Lincoln
Manchester Metropolitan University
University of Portsmouth Higher Education Corporation
Plymouth University
University of South Wales
Teesside University
University of Wolverhampton

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