



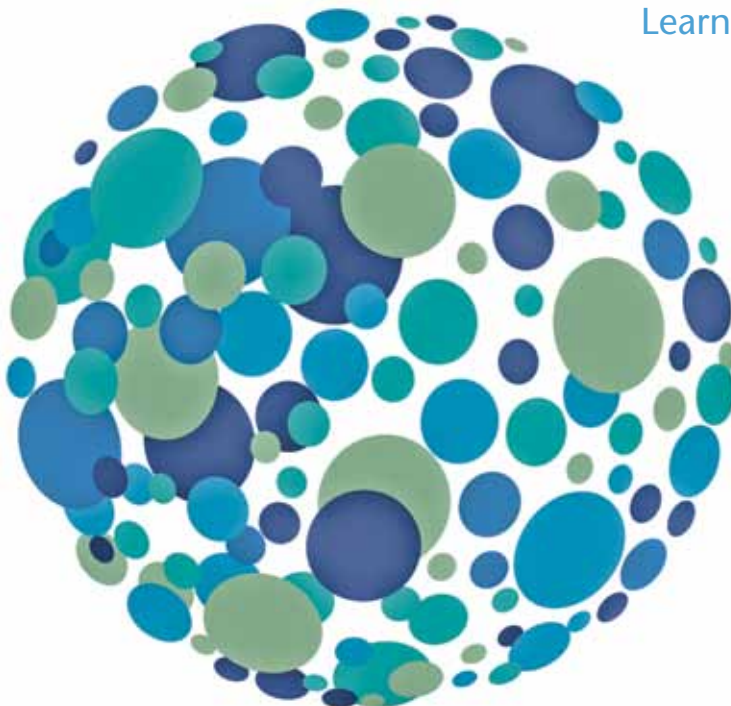
**QAA
Scotland**

Report of the Scottish Higher Education Enhancement Committee

International Benchmarking

Shaping the Twenty-First Century Doctorate:
Learning from international practice

March
2012



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Foreword

I am pleased to introduce the final report for International Benchmarking: Shaping the 21st Century Doctorate - Learning from international practice.

This work forms part of a suite of outputs from the International Benchmarking project, which includes case studies collected from Scottish institutions, an exercise scoping international practice, and various workshops held throughout the sector by QAA Scotland in collaboration with other organisations, notably VITAE, SFC and HEA Scotland.

The project was commissioned by the Scottish Higher Education Enhancement Committee (SHEEC) who assigned the work to a working group which I chaired. Membership of the group included experienced colleagues responsible for research student support and strategy from a variety of different areas in Scottish higher education institutions. The working group was supported by officers from the Quality Assurance Agency for Higher Education (QAA) Scotland and by a consultant, Avril Manners, Director of the Graduate School of the Scottish Universities Physics Alliance. The work was also supported by Gill Clarke, who was involved in editing the final report. My thanks and appreciation go to them.

There are many interesting messages that have emerged from the work, not least that in many ways Scotland can be proud of the practice that has developed to support research students, both before and as a result of this exercise. The work gave the sector an opportunity to look beyond its borders, to look at practice elsewhere, and to form new and potentially exciting links with international colleagues, from which much will be learnt in the future.

I would like to thank all those who contributed to the project, including my fellow working group members, those who provided case studies, and those who attended the various workshops. Mr David Bottomley and Ms Frances Morton, formerly of QAA Scotland, were instrumental in starting the project, and Ms Heather Gibson of QAA Scotland helped bring the project to its conclusion.

Dominic Houlihan
University of Aberdeen

Executive summary

Introduction

This report has been written on behalf of the Quality Assurance Agency for Higher Education (QAA) and the Scottish Higher Education Enhancement Committee's (SHEEC's) International Benchmarking Working Group (IBWG) on Shaping the 21st Century Doctorate. Its purpose is generally to contribute to the enhancement agenda in Scottish higher education, and specifically to highlight effective practice in doctoral education in a way that enables Scottish institutions to learn from what is happening elsewhere in Scotland and also internationally.

The report is structured in six chapters:

- 1 Introduction and context (Annexes 1, 2 and 3)
- 2 Supporting diverse doctoral students and surveying the student experience (Annex 4)
- 3 Standards, quality and review of doctoral programmes (Annex 5)
- 4 Developing and supporting critical mass and diversity (Annexes 6 and 7)
- 5 Supporting the development of doctoral skills and attributes (Annexes 8 and 9)
- 6 Conclusions and recommendations.

In each chapter, the IBWG has drawn widely on practice that can be seen to support and enhance the research student experience, including frameworks for safeguarding academic standards and the quality of programmes.

The report focuses on doctoral degrees, rather than research degrees as a whole. However, some elements, especially the examples of practice, will be of general interest to anyone contributing to research degrees.

Chapter 1 summarises the background to the report, the IBWG's rationale for commissioning it and how evidence was gathered. Annexes 1 and 2 provide details of the IBWG's membership and programme of work. This chapter also provides a broad context for the project, including information about different forms of doctorate and their characteristics (Annex 3), and about the growth in research students; both in Scotland (Figure 1) and across countries of the Organisation for Economic Cooperation and Development (OECD) (Figure 2). Finally, and importantly, this chapter emphasises the way in which doctoral education can be broadened through internationalisation and the many different ways in which an international perspective can be provided. It includes details of international collaborations in which Scottish universities are involved, together with international conferences, summer schools and details of how Scottish institutions attract international visitors. There is an example of practice at the University of Nottingham to illustrate practice elsewhere in the UK. Internationally, the chapter draws on examples from the USA Council for Graduate Schools. With regard to student mobility, there are case studies from Canada and non-UK Europe (cotutelle programmes).

Chapter 2 is about supporting doctoral students at a general level. It contains details about how student feedback is obtained and used in different contexts to improve practice.

This chapter also considers how best to support part-time and international students, drawing on Scottish, other UK and international activities and case studies; the international reference points being Aarhus (Denmark), Tokyo (Japan), and Adelaide (Australia) (Annex 4).

Chapter 3 focuses on academic standards, quality assurance and review of doctoral education. It summarises policy and guidance frameworks within which research degrees are delivered, looking at Scotland (Figure 3) and the UK more generally, with details about the Scottish Enhancement-led Institutional Review (ELIR) system and including links to reference sources about different research qualifications. Chapter 3 also contains references to international quality assurance systems for doctoral education across non-UK Europe, with case studies from the Netherlands, Ireland, North America, Australia, and New Zealand. This chapter also considers supervision and the challenges of joint degrees, using examples of practice from the University of Melbourne in Australia.

Chapter 4 is about developing and supporting critical mass and diversity in doctoral education and draws on graduate school models and centres for doctoral training as examples (Annex 6). This chapter summarises the unique and effective model of research pooling in Scotland (also commenting on its complexity), using case studies in physics, social sciences, medicine, engineering and mathematics to demonstrate the effectiveness of graduate schools and doctoral training centres. There is also an example of practice from the Manchester Doctoral College at the University of Manchester and an example from a social sciences doctoral school at the University of Sussex. The chapter concludes with several non-UK European case studies, plus case studies from three Australian universities (Melbourne, Monash and Newcastle) and two North American universities (Stanford and Michigan) (Annex 7).

Chapter 5 summarises the significant UK developments in supporting skills development in research education, with references to Roberts' funding and the work of Vitae (formerly UK Grad), including the Researcher Development Framework which spans all stages of research development from postgraduate student to international researcher. This chapter contains information about postgraduates as teachers (Annex 8) and their support and development, both UK-wide and internationally. UK case studies are from the University of Glasgow, Durham University, the University of Liverpool, Edinburgh Beltane, the University of Strathclyde, the University of Edinburgh, and the SPIRIT programme. International case studies include Emory University in Atlanta, Georgia; the University of Toronto; the University of Western Australia; the University of New South Wales; the University of Miami (with Hamburg); and the University of Michigan. The chapter also focuses on entrepreneurship, leadership, management and professional skills with examples both in the UK and internationally (Annex 9).

Chapter 6 summarises some of the main findings and points of interest in the report. Rather than being overly prescriptive in the ways in which Scottish institutions use the report's contents, the IBWG's intention is that individuals and institutions will adopt and adapt any practices that are of particular relevance to them and their doctoral students, especially when undertaking restructuring or making changes to provision. The IBWG would nevertheless wish to highlight the following recommendations as being significant outcomes of the report, which may be worthy of further discussion by institutions and sector-wide bodies in Scotland.

The IBWG recommends that:

- institutions take a strategic approach to attracting home students to doctoral programmes, including consideration of diverse modes of study and sponsorship (p 60)
- all Scottish institutions take part in the Postgraduate Research Experience Survey (PRES) or conduct a similar satisfaction survey of their postgraduate research student (PGR) population and that the results are aggregated to provide quantitative evidence (p 60)
- to encourage Scottish university participation in joint international PhD programmes, Scottish higher education institutions (HEIs) collaborate to form a central resource providing funding, advice and draft agreements, drawing on experience elsewhere (p 61)
- all Scottish institutions provide research communication programmes for international PGRs and accessible support, both academic and non-academic, for international students and their families (p 61)
- there is a need to be more proactive and structured about how academic standards and the quality of doctoral programmes are reviewed, internally and externally (p 61)
- it is timely to have a review of qualification titles at doctoral level, using the doctoral qualifications descriptor and Scottish Credit and Qualifications Framework (SCQF) (Chapter 3) (p 61)
- it would be useful for Scottish HEIs to consider a coordinated approach to initial and supplementary supervisor training that all supervisors are expected to engage in (p 61)
- Scottish institutions may benefit from a review of existing graduate schools and doctoral training centres, so as to optimise their effectiveness and reduce any duplication of effort (p 62)
- all Scottish institutions awarding research degrees have in place a teaching preparation programme drawing on best practice in the rest of the UK and overseas, which PGRs begin, and if possible complete, before they begin teaching (p 62)
- to assist doctoral graduates in the transition to the next step in their careers, Scottish institutions develop opportunities for postgraduate internships and affiliate programmes, drawing on best practice in the rest of the UK and internationally (p 62).

Chapter 1 - Introduction and context

This first chapter sets the scene for the report. As well as providing information about the background and purpose of the project and how the chapter topics were arrived at, it shows the recent growth in doctoral students (Figures 1 and 2) and summarises some of the international models of doctoral degrees.

1.1 Background and purpose

This report is the outcome of a project that QAA Scotland, with the Scottish Higher Education Enhancement Committee's (SHEEC's) International Benchmarking Working Group (IBWG) on Shaping the 21st Century Doctorate, has undertaken to learn from international practice in doctoral education (including practice in Scotland and the rest of the UK where it is innovative and effective, as well as further afield). The project is part of an integrated programme of work in the area of the Doctoral Degree Experience undertaken by QAA Scotland, the Scottish Funding Council (SFC), Vitae, and the Higher Education Academy (HEA). As part of the exercise, it was agreed that QAA Scotland, SFC, Vitae and the HEA would coordinate their various areas of work to maximise the overall impact and to avoid any duplication of work.

The report is about doctoral degrees and does not include research master's programmes, but some elements, especially some of the examples of practice, will be of general interest to anyone contributing to research degrees in the broadest sense.

The project aims to identify the issues affecting the postgraduate researcher experience in Scottish higher education institutions (HEIs) with the objective of sharing good practice among institutions, thereby enhancing the experience for postgraduate researchers, in accordance with the UK-wide Concordat to Support the Career Development of Researchers.

The benchmarking work on doctorates followed on from the international benchmarking of student support which took place in 2008. The doctoral work also emerges alongside relevant related developments such as the publication of QAA's *Doctoral degree characteristics* guide (2011) and the complementary *The UK doctorate: a guide for current and prospective candidates*, developed in partnership with the National Union of Students (QAA, 2011); the Department of Business, Innovation and Skills' (BIS') Postgraduate Review (Smith et al, 2010); and the Researcher Development Statement (Vitae, 2010) and Framework (Vitae, 2010). Other reference points include *Chapter B11: Research degrees* of the UK Quality Code for Higher Education (the Quality Code) (QAA, 2012) and the Research Councils UK (RCUK) Concordat for early career researchers (referenced later in the report). These are some of the UK-wide documents contributing to the overall guidance framework within which Scottish institutions offer doctoral programmes. Other reference sources are mentioned throughout the text and include hyperlinks to websites where more information is available. The SFC, HEA and Vitae were represented on the project Working Group (see Annex 1). Further information about all these organisations, their roles and responsibilities can be found on their respective websites.¹

The overall purpose of the project is to support the Scottish higher education sector in enhancing the postgraduate research degree student experience and to identify, share, discuss and disseminate innovative practice. The intended outcome is to make available

¹ QAA: www.qaa.ac.uk, RCUK: www.rcuk.ac.uk, BIS: www.bis.gov.uk, Vitae: www.vitae.ac.uk, SFC: www.sfc.ac.uk, HEA: www.heacademy.ac.uk.

a range of practical information to support doctoral students and programmes, in Scottish universities in particular, but which will also be of interest to others supporting and managing doctoral education.

The International Benchmarking Working Group (IBWG) for this project, established in December 2009, was chaired by Professor Dominic Houlihan (Vice Principal Internationalisation, University of Aberdeen). Avril Manners, Director of the Scottish Universities Physics Alliance (SUPA) Graduate School, was a consultant for the project.

One of the benefits of involving sector-wide organisations in the project was to enable coordination of different areas of work, so as to maximise the overall impact and to avoid duplication.

The IBWG's membership is summarised in Annex 1. It reflects the broad range of higher education institutions in Scotland. The IBWG's programme of work, including dedicated events, visits and conference attendance, is summarised in Annex 2.

1.2 Definition of benchmarking and the emergence of chapter topics

Definition of benchmarking

In the context of this work, benchmarking was defined as **identifying, considering, comparing and learning from developing practice** internationally. To be of most value, the work was concerned not just with current established practice but also with learning from innovation, ideas and developing thinking in the provision of doctoral degrees and the related student experience. This will contribute towards the development and shaping of the twenty-first century doctorate in Scotland.

Chapter topics

The topics of the report chapters were identified initially at a scoping workshop facilitated jointly in September 2009 by QAA Scotland, SFC and Vitae. Participants in the workshop considered four themes emerging from the results of the HEA Postgraduate Research Experience Survey (PRES) in 2008. At its first meeting in December 2009, the IBWG considered the outcomes of the scoping workshop and agreed that the most important themes concerning research students appeared to fall into five areas:

- the part-time student experience
- the international student experience
- standards, quality and review of doctoral degrees
- the delivery of structured doctoral education
- supporting doctoral education, including supervision.

An important consideration for the IBWG when deciding on the scope of the report was the competitiveness and attractiveness of Scottish doctorates, for both home and international students (Kemp et al, 2008).

The report was arrived at through a process of consultation and refinement with the sector, taking account of other publications emerging during the two-year research period.

1.3 Growth in research students

Over the last decade in Scotland, there has been a steady increase in postgraduate researcher numbers (full-time equivalents (FTEs)). The percentage increase from 2001-02 to 2009-10 is 38.1 per cent, with an 11.3 per cent increase from 2008-09 to 2009-10 in the number (FTEs) of research students studying in Scotland. A similar growth pattern is seen in all 27 OECD countries. The growth is greater for women, and there has been an increase in international PGRs. Further details can be found in Figure 1 below.

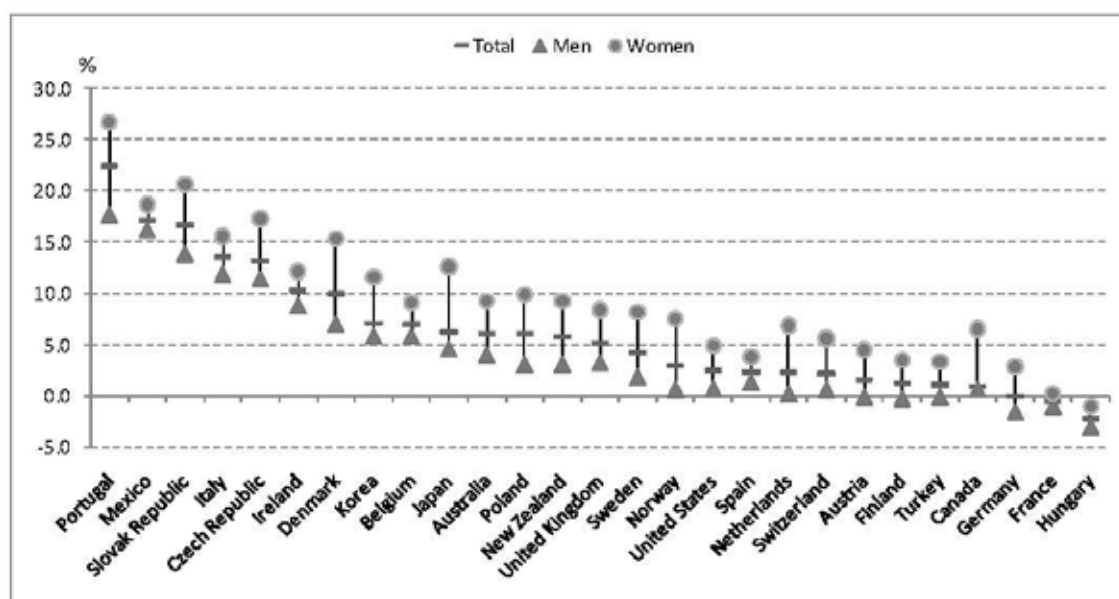
Figure 1: Higher Education Statistics Agency (HESA) numbers (student FTE - HE all years) for PGRs in Scotland (2001-02 - 2009-10)

Scotland is not alone in increasing its PGR population. OECD 2010 reports that '... the number of doctoral graduates has dramatically increased. In the OECD area, some 200,000 doctoral degrees were awarded in 2006 against 140,000 in 1998, a 40 per cent increase in just eight years'.

	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	% change 2001-02 to 2009-10	% change 2008-09 to 2009-10
Total Scotland: all PGRs	6,645	6,661	6,829	6,820	7,064	7,664	7,930	8,242	9,177	38.1%	11.3%
Total Scotland: non-UK PGRs	2,382	2,530	2,759	2,957	3,055	3,379	3,577	3,857	4,279	79.6%	10.9%
Scotland: non-UK PGRs/ all PGRs	36%	38%	40%	43%	43%	44%	45%	47%	47%	30.6%	0%

Of the 27 countries shown in Figure 2, only three (Germany, France and Hungary) do not demonstrate an average annual growth from 1998-2006. Portugal has the highest average annual growth and the growth for women is markedly higher than that for men in all countries. An average annual growth of 5 per cent for the UK is in line with the HESA numbers (FTEs) for PGRs in Scotland (2001-02 to 2009-10).

Figure 2: Average annual growth of doctoral degrees - 1998-2006



Source: OECD Education database, 2009.

This increase in FTEs (and PhD completion rates) has had an impact on all aspects of the research student experience, especially on the supervision of research postgraduates. These developments are explored later in the report.

1.4 International models of the doctorate

This work was undertaken with a view to identifying, considering, comparing and learning from developing practice internationally. To optimise value, the project was concerned not just with current and established practice but also with learning from innovation, ideas and developing thinking in the provision of doctoral degrees and the related student experience. The IBWG thought this evidence-based approach was key to the development and shaping of the twenty-first century doctorate in Scotland.

Most of the examples of practice provided in the report are grouped in annexes in the .pdf versions of the report, and will also be provided as clickable links in the text in the electronic version. Both will be available from the QAA Scotland website. Some examples describe well established practice that has been proved to be effective; some show more recent innovation and may be sector-leading; yet others are novel and demonstrate creativity in a particular field or subject area. The examples are not meant to be definitive or comprehensive but to provide examples that Scottish institutions can adapt wherever they might make a useful contribution to their own context.

Below (1.4.1, 1.4.2 and 1.4.3), to set the context for the rest of the report, we outline some different doctoral models as reference points.

1.4.1 Forms of doctorate

United Kingdom

Scottish doctorates are situated in both the UK and the wider European context, and also in the global environment. The European context includes expectations arrived at as part of the Bologna Declaration and related developments which are covered later in this report.

The PhD and the doctorate generally has global currency, and it is accepted that the award of the title 'doctor' indicates the holder has been judged capable of conducting independent research, with all its responsibilities. The following subsections briefly outline different models of the doctorate in the UK, non-UK Europe and in other countries, before we turn to how the experience of Scottish doctoral students can be broadened by international engagement.

In the UK, including in Scotland, a range of different forms of doctorate is offered by higher education providers. As outlined by HEFCE on behalf of the UK funding councils for the Research Excellence Framework (REF):

...research is defined as a process of investigation leading to new insights, effectively shared. It includes work of direct relevance to the needs of commerce, industry, and to the public and voluntary sectors; scholarship;² the invention and generation of ideas, images, performances, artefacts including design, where these lead to new or

² Scholarship for the REF is defined as the creation, development and maintenance of the intellectual infrastructure of subjects and disciplines, in forms such as dictionaries, scholarly editions, catalogues and contributions to major research databases.

substantially improved insights; and the use of existing knowledge in experimental development to produce new or substantially improved materials, devices, products and processes, including design and construction.

All UK doctorates fall within guidance provided in the UK's Frameworks for Higher Education Qualifications which are explored further in Chapter 3 and which are in alignment with the European Higher Education Area's Qualifications Framework, developed as part of the Bologna Declaration and related activities, including the Salzburg Principles, set out in Chapter 3.

The 'Targeting Innovation' report by Ken Marr (2009) notes that there are a number of types of doctorate undertaken in the UK. QAA's *Doctoral degree characteristics* (2011)³ summarises these and provides a comprehensive but not exhaustive reference list, with the main characteristics of each form of doctorate.

The following extract from *Doctoral degree characteristics* applies to all forms of doctorate in the UK.

3 Forms of doctorate and naming of awards

The sections below (see Annex 3) summarise the different doctorates offered by UK universities. UK doctoral graduates are expected to reach a comparable level of intellectual achievement irrespective of the programme and subject. The doctorate (the 'third cycle' of degrees in the Bologna Process) is distinctive because it is about creating new knowledge, or applying existing knowledge in a new way; this is the characteristic that differentiates it from bachelor's and master's (first and second cycle) degrees. Some research master's programmes take up to two years to complete and are based solely on an independent research project. In many cases research master's degrees are considered to prepare candidates for doctoral study. The normal maximum period of registration for the UK doctorate is four years full-time and six to eight years part-time.

The doctoral qualification descriptors in the UK qualifications frameworks summarise succinctly the principal attributes of doctoral graduates. These provide a regulatory and guidance framework for doctoral degrees and show the differences between first, second and third cycle qualifications.

Annex 3 contains a further extract from this document (section 3.1) which summarises the UK's doctoral awards and their main characteristics.

Doctoral degree characteristics also defines higher doctorates (section 3.3), which are distinct from other doctorates and not included in this report:

Higher doctorates (typically the Doctor of Science, DSc or ScD and DLitt) are a higher level of award than the DPhil/PhD or professional or practice-based doctorates. They are normally awarded by institutions to staff who have earned a high reputation for research in their field through their professional practice, which may or may not have been gained in an academic institution. The DSc is typically a mid-career qualification; candidates seeking promotion to professorial level in a STEM subject may be expected already to have gained a DSc. The DLitt, by

³ www.qaa.ac.uk/Publications/InformationAndGuidance/Pages/Doctoral_characteristics.aspx (see section 3, pages 12-18).

contrast, is typically awarded to experienced academics, usually already holding professorships, who have published a significant number of books and peer-reviewed articles. Higher doctorates are therefore always awarded for published works.

Nerad & Heggelund (2008) report that changes have taken place in the last 40 years with the development of new models for doctoral programmes, the increasing number of part-time and international students, and a reduction in the gender imbalance of the 1960s. In the UK one of the main changes has been in the structure of the PhD, with greater emphasis on formal training and structured elements, in common with other professional and practice-based doctorates. Section 4 of *Doctoral degree characteristics* summarises the factors affecting degree structures and modes of study for doctoral students:

Many doctoral students in the UK study in either a graduate school (which may be at institution, faculty or school/department level, depending on critical mass and other factors) or a centre for doctoral training, many of which are funded by the UK research councils. Some graduate schools contain both doctoral and research master's students; others are only for doctoral students. *Doctoral degree characteristics* summarises these two models in section 1.5. Both graduate schools and centres for doctoral training or partnerships have a strong emphasis on the development of research methods and personal skills training, and some provide a central point of delivery of structured courses for research students. Similar European models are set out below and show the increased focus on cohort-based research education which contains structured elements. Chapter 4 provides further details about graduate schools and centres for doctoral training.

An in-depth discussion of different doctoral models across the international research community lies outside the remit of this report. However, there are many resources available via the UK Council for Graduate Education (UKCGE) providing detailed information.

For further information about professional and practice-based doctorates readers are directed to the following resources:

- The UKCGE website⁴ and, in particular, the proceedings of the conference 'Developing the Professional and Practice-based Doctorate', 17 November 2010⁵
- The active 'Special Interest Group for Professional and Practice-Focused Doctoral Research'.⁶

Given the expansion in doctoral education over the last decade, there is clearly much diversity and debate across disciplines about titles, content and purpose of the doctorate.

Non-UK Europe

Doctoral models across Europe have both similarities and differences. Like the UK, continental European universities offer doctorates within Europe-wide frameworks, as 'third cycle' qualifications. However, countries and institutions have significant autonomy in doctoral models and structures. A generally agreed principle which is part of Bologna agreements is that qualifications are based on the achievements learners can demonstrate at the end of the programme of study, rather than the time they

⁴ www.ukcge.ac.uk

⁵ www.ukcge.ac.uk/events/pastevents/1011area/pd10

⁶ www.professionaldorates.org

have spent completing it; this gives flexibility to institutions to offer doctorates through models that suit the subject and the learner, as long as s/he is able to meet the relevant qualification descriptor (explained further later in the report). The example of practice from Germany below is just one example of the variety and diversity of doctoral education that exists across non-UK Europe.

Germany

Traditionally a country which endorsed the Humboldtian model of 'master and apprentice' for PhDs, Germany has undergone many changes since the 1990s when the German Rectors' Conference and the Science Council addressed problems that existed in the model.

The model of graduate colleges was then introduced, in the form of themed and interdisciplinary research groups. Kehm (2008) states that in 2001 around 285 graduate colleges had been established, some with partner higher education institutions (HEIs) abroad. These colleges did not become the general model for postgraduate education however, and in 2004 the German Academic Exchange Service (DAAD), in association with government and funding bodies, established 50 international postgraduate programmes (IPPs) to try to reform doctoral education and training, with specific attention paid to enhancing Germany's competitive advantages in research degrees. Further change is anticipated with the Bologna third cycle, including greater influence of government and national bodies in the research training that forms part of doctoral programmes.

Worldwide

Australia

The first doctoral programme began in 1946 at the University of Melbourne, where the first three PhDs were awarded. Evans, Evans and Marsh (2008) state that 'the numbers of PhD students grew rapidly through the early twenty-first century' and the numbers of international students 'have increased sharply in the last decade' (p 172).

Research degrees in Australia are now offered within the Australian Qualifications Framework (AQF). Further details about the AQF can be found in the 'International' section about academic standards, quality assurance, enhancement and review in chapter 3.

Australian research doctorates are fully subsidised by the Australian Government. The model of doctoral degrees was devised from the UK model, rooted in research. While the PhD has been seen traditionally as a marker of ability to join academic staff, and as a marker of success for universities, drivers of change in Australia have led to diversification in recent years to include practice-based and professional doctorates such as Doctor of Psychology, Doctor of Creative Arts, and Doctor of Divinity, undertaken by mid-career researchers among others. As in the UK, it has also meant that a more diverse student base is undertaking research degrees.

The PhD in Australia spans a wide range of disciplines, including the creative and performing arts. Australia offers a 'multimodal' candidature which is essentially defined by the Government Department of Education, Science and Technology (DEST) to 'indicate undergraduate and postgraduate students who are enrolled on campus for one or more units and off-campus for the balance'. These are for the newer professional and

practice-based doctorates.

As in the UK, institutions have their own regulations for awarding PhDs: research is undertaken and programmes devised by individual departments, schools or faculties.

The exception is the Australian PhD, which is a three to four-year full-time programme of research, and results in a written thesis, examined externally.

Evans et al state that the Australian PhD components include the major research project, research training, ethics and grant applications, involvement in regular seminars and oral presentation skills. Australian universities also offer generic skills training and development, career planning and development of leadership skills through graduate schools, which are many but not widespread. Coursework for PhDs is variable; governmental regulations prescribe that doctoral programmes have at least 33.3 per cent coursework in a research PhD. This is generally, however, in the newer model PhDs. Most universities in Australia require formal confirmation of specific skills after one year, including acquirement of research training skills, submission of a significant 'upgrade' report, public presentation, and an interview by a 'confirmation committee'.

In some cases and sometimes affected by subject, mobility is a key feature of Australian PhDs in that programmes such as joint doctoral programmes with France - for example the 'cotutelle'. Australia links this with the 'third cycle' in the Bologna Process.

Examination of PhD theses in Australia is generally by external and internal reviewers, although some universities only require two independent examiners. The viva is not commonly used as part of the examination process in Australia. However, presentation of the research work to academic staff and peers is becoming increasingly used prior to submission to allow students to respond to critique in their final thesis.

Specific to Australia is the issue of 'indigenous' students - Aborigines and Torres Strait Islanders. DEST figures show that the number of indigenous students is low at 0.5 per cent (bearing in mind the indigenous population in Australia is around 2 per cent), but is increasing slowly.

Canada

There is no national system for supporting, managing and delivering doctoral education in Canada - the latter is undertaken in many ways due to variations in universities, provincial governments and federal government. The regional distribution, or the variations in this, shows the lack of a coordinated approach. For example, numbers revealed by Statistics Canada in 2001 show that 39.9 per cent of PhDs were undertaken at Ontario University, with 31.1 per cent at Quebec University. In contrast, only 1.8 per cent of PhDs were undertaken at Saskatchewan and 0.4 per cent at Prince Edward Island.

Government support is unequal in terms of disciplines. For example, 66 per cent of funding is invested in life sciences and the rest are fellowships within the humanities (43 per cent). The remaining 26 per cent is made up of fellowships in any subject other than science and humanities. This affects programme quality, and reduces the need for science students to work outside their doctoral study.

The average completion rate is just under six years for science PhDs, and can be six years or more for social sciences and humanities.

Key recent developments in Canadian doctoral education have been university restructures to provide different doctoral programmes and research training. Examples include: Montreal and Toronto Universities offer 30 collaborative and interdisciplinary programmes; University of British Columbia offers 11 interdisciplinary programmes and one multidisciplinary programme; Manitoba University and Simon Fraser University also offer individual personalised programmes to doctoral candidates.

South Africa

Doctoral programmes in South Africa generally have a three-year programme of research, built upon honours and master's components.

United States of America

Nerad et al (2008) state that the main goal of doctoral education in the United States is to create the next generation of academic staff for universities. This principle is exemplified in the way in which the quality and academic standards of research doctorates are periodically reviewed by the National Research Council.⁷

The types of doctoral research that exist in the USA are the traditional PhD by research, and a number of professional doctorates such as Doctoral Education (EdD), Doctor of Social Work (DSW), and Doctor of Public Health, but not a medical doctor (MD) or doctor of jurisprudence (JD). PhD programme structures are similar to those in the UK, the rest of Europe and Australia; some of the professional doctorates (not covered in this report) have distinctive structures and are taken by candidates while in full-time professional employment.

Admission to doctoral research is upon completion of a four-year undergraduate degree. As in the UK, and depending on subject area, there are two main routes: entry following completion of a master's degree or proceeding directly from a highly classified bachelor's degree to a PhD programme.

There are two basic structures for the doctoral programmes, which apply to Social Sciences and Humanities and Science and Engineering respectively. In Social Sciences and Humanities candidates undertake three years of coursework, with a piece of written publishable work and exams at the end of this time period. Students then work on dissertation proposals followed by undertaking a period of research. Examination is undertaken by the dissertation committee who will read the thesis, and then the student will present their work to the committee. In Science and Engineering students undertake the same process but have to demonstrate advanced knowledge at the end of the first year.

At the end of the second and third year students undertake an exam and a publishable paper. The viva takes place at the end of the research period, which can range from two to three years.

It is interesting to note that more than 400 higher education institutions award doctorates. However, half of the completed doctorates are concentrated in only a few universities and, as in most other countries, completion times vary among subjects.

The American PhD has undergone many changes and responded to innovations as a result of changing student populations, new methods of learning and newly emerging disciplines.

⁷ The National Research Council's latest report (Jeremiah P. Ostriker, Charlotte V. Kuh and James A. Voytuk, editors, 2010) can be viewed at: <http://sites.nationalacademies.org/PGA/Resdoc/index.htm>.

1.4.2 Broadening the doctoral experience through internationalisation

As a conclusion to this introductory and contextual chapter, we consider how the doctoral student experience can be broadened, using some UK-wide and international examples, with emphasis on internationalising the student experience and mobility; two areas identified by the International Benchmarking Working Group (IBWG) are of special interest.

Internationalising the student experience and mobility - practice in Scotland

The internationalisation experience of doctoral candidates was perceived by the IBWG as an important factor both in increasing the competitive advantage of doctoral students and in broadening the Scottish research base.

International collaborations for Scottish higher education institutions

There are different types of higher education institutions (HEIs) in Scotland belonging to various consortia - such as the Russell Group, the 1994 Group, the Million + Group, the University Alliance, and the Post-1992 Group. Evidence shows that some Scottish HEIs are members of other international organisations such as Universitas 21 - a global network of research intensive universities; the League of European Research Universities (LERU) - a consortium of Europe's most prominent and renowned research universities; and the Coimbra Group - a network of 40 of Europe's oldest and most prestigious universities.

In order to increase international partnerships, there is scope for Scottish HEIs to become better involved with international organisations that foster collaboration.

International travel

Research is a global occupation and particularly in the areas of science and engineering, it is very common (and indeed, should be encouraged) for doctoral candidates to travel to international conferences, colloquia and to take part in international research collaborations.

The necessity for international travel for doctoral candidates is acknowledged by the UK Research Councils who include travel grants and accommodation allowances as part of their Research Council studentships.

International conferences, summer schools and distinguished visitors

Equally, Scotland plays an active part in bringing the international world to researchers by hosting international conferences, an example of which is the Scottish Universities Summer School in Physics (SUSSP).⁸

This programme has been running for over 20 years and brings at least one international summer school to Scotland every year. These summer schools host approximately 100 PhD students from all around the globe who take part in an intense lecture series as part of their graduate education. The programme of lectures is taught by international experts in the field, and in parallel with intensive study periods there is also the opportunity for social and cultural activities which in Scotland often include a whisky tasting or a ceilidh. Many long-lasting and fruitful collaborations have been made at

⁸ www.sussp.ac.uk

summer schools and the social interactions between the graduate students are equally important in building an international research network for Scotland.

Exposing postgraduates to the best of the international research community can be achieved when departments set up a programme of distinguished visitor or expert lectures to supplement graduate education and training.

Exchanges

In November 2011, the Scottish Government announced £250,000 to support exchanges of early career researchers to India, North America and China. The Scottish Funding Council (SFC) has distributed the monies to the Research Pools to allocate on a competitive basis. This confirms the government's support of the internationalisation of doctoral candidates and SFC's commitment to the Research Pools as a means of developing the international research capability for Scotland.

Barriers

The main barriers to increasing internationalisation of doctorates by travel, conferences, summer schools and distinguished visitors are time and cost. However these are not insurmountable, and in the Research Pools or other collaborative environments, distinguished visitor lectures, conferences and summer schools can be shared, making them much more efficient and cost effective. Supervisors' and other academic connections can be shared when setting up conferences, summer schools and distinguished visitors and for setting up doctoral exchanges.

Internationalising the student experience - the rest of the UK

The experience of the rest of the UK is very similar to Scotland. As already mentioned, the University of Nottingham has two international campuses and a three-way graduate school.

Example of practice - The University of Nottingham International Graduate School

By combining graduate school structures and support across all three campuses that utilises a three-way transfer of staff and postgraduate student communication, there has been improved provision for all PGR students resulting in increased take-up and engagement.

Examples of activities that have taken place across all three campuses include: Building Experience and Skills Travel Scholarship Awards (BESTS), Research Showcase, and an online literature review process course.

A non-UK European perspective: Erasmus Mundus and Joint doctorates

In Europe, there are Erasmus Mundus Joint Doctorates (EMJDs).⁹ These doctoral-level training and research programmes offer fellowships covering up to three years of doctoral activities. The Erasmus Mundus programme offers scholarships to students and to doctoral candidates from all over the world to follow Erasmus Mundus master's courses and joint doctorates.

⁹ http://eacea.ec.europa.eu/erasmus_mundus/results_compendia/selected_projects_action_1_joint_doctorates_en.php

As already discussed, it is quite common for Scottish or British universities to set up jointly-awarded PhD programmes.

An international perspective: the United States of America

The USA Council for Graduate Schools conducts an annual International Graduate Admissions Survey.¹⁰ The purpose of this survey is to monitor changes in the enrolment of students from abroad seeking master's and doctoral degrees from USA colleges and universities. The survey looks at applications, admissions and enrolments. The survey has results from 2004 until 2011 and shows an increase in applications from international students from 2006 with an 11 per cent increase this year. China, India, and South Korea are the top three countries of origin for international graduate students in the United States.

1.4.3 Joint doctoral programmes and encouraging mobility of doctoral students

As many of the world's issues are not restricted by national boundaries, there is an increasingly international and collaborative approach to graduate education as is demonstrated in a 2008 US News article.¹¹ The article states that 29 per cent of USA graduate schools have dual or joint degree programmes with international universities and that 24 per cent plan to establish new programmes over the next two years. Given that the article was written in 2008, the expectation in 2011 would be that more than half of USA graduate schools have dual or joint degree programmes with international universities.

Educational partnerships and collaborations are also on the increase in Europe: jointly supervised and sometimes jointly awarded PhDs promote international student mobility, knowledge exchange and international research collaborations. There are two main models: the double (cotutelle) degree model which results in two individual institution awards, and the fully integrated joint doctoral programme. Other models include individual students who may be sponsored by the European Commission or others, spending part of their degree programme in another country and where supervision and resources are provided by both the home and the host institution. In these cases, institutions often put in place basic joint agreements to support the student and to clarify supervision, as well as providing access to research resources and modes of assessment.

Examples of global joint doctoral programmes with Scottish universities include:

- The Universitas 21 Joint PhD Programme
- The Franco-Scottish Joint PhD Programme
- The Macquarie University (Sydney) Bilateral Joint PhD Programme

The challenges of joint degrees

The main challenges in setting up joint doctoral programmes are the differences in national legislation, regulatory frameworks and academic governance, coupled with the requirement to ensure funding, academic standards, quality assurance, recruitment, and selection processes.

¹⁰ www.cgsnet.org

¹¹ www.usnews.com/education/articles/2008/03/26/how-an-international-approach-can-help-your-degree

Encouraging mobility of doctoral students

Growth in student mobility is one of the key objectives of the pan-European Bologna process (details of principal Bologna initiatives are provided later in the report). The recent increase in joint and collaborative doctoral programmes has helped to implement this objective by encouraging greater mobility, especially across Europe. Below are some examples of European and Canadian initiatives.

Europe

Initial Training Networks (ITNs)

The European Commission's Framework Programme (currently FP7) supports the mobility of doctoral researchers through the ITN programme for Early Career Researchers. This includes multi-site ITNs, Innovative Doctoral Programmes (IDPs) and Engineering Doctoral Programmes (EDPs).¹²

The Cotutelle PhD

The University of Pierre and Marie Curie (UPMC) increases the mobility of doctoral students by the Cotutelle PhD which is a jointly supervised PhD thesis. Its purpose is to encourage the mobility of doctoral students, to increase the international dimension of doctoral schools, and to develop scientific research between France and other countries. The PhD student is enrolled in both institutions and spends time in each but only pays one set of fees. They have two supervisors - one in each institution - and produce a thesis with one viva that then results in two degrees.

The steps for this process are clearly outlined on the UPMC website.¹³

The Graduate Institute of Geneva

The Graduate Institute of Geneva (GIG) has many partnerships and exchange programmes. Details of these and associated funding sources are available on the GIG website.¹⁴

The two Canadian examples below summarise some of the key factors to consider in doctoral student mobility, including the support that students need if they are to be successful in studying away from their home university.

Canada

A Canadian study

A two-phase study, Promoting International Mobility in Doctoral Education: A Review of Issues, Policies, Programs (Jane Knight, 2008-09), was commissioned by the Canadian Social Sciences and Humanities Research Council (SSHRC) to explore international student mobility issues at the doctoral level, and to consider whether enhancements should be made. Inhibitors to mobility were examined and it was found that the main factors were: funding (lack of finance); academic (lack of linkages, credits and support); personal (student employment or family responsibilities); and cultural or language.

¹² http://ec.europa.eu/research/participants/portal/page/people;efp7_SESSION_ID=MstsPPGdHfGQIY23MZpsTZGJL25J6vBQGrQyDyn2cM28X0qDpjyp!740145386?callIdentifier=FP7-PEOPLE-2012-ITN

¹³ www.upmc.fr/en/international/mobility_for_phd.html

¹⁴ <http://graduateinstitute.ch/corporate/teaching/exchanges.html>

The University of British Columbia Mobility Award

The University of British Columbia (UBC) in Canada encourage graduate students to take part in international research activities by the use of awards such as the Graduate Student International Research Mobility Award Office of the Vice President Research and International. This award has a value of around \$1,500 and supports UBC graduate students who wish to carry out research in a leading university outside of North America or academic staff who wish to host graduate researchers from outside North America.¹⁵

Australia

Mobility is a key feature of Australian PhD programmes such as joint doctoral programmes with France - for example the 'cotutelle'. Australia sees this as the result of the third level in the Bologna Process and is very keen to set up partnerships with European universities.

Example of practice - The University of Melbourne

The Melbourne School of Graduate Research at The University of Melbourne has many jointly awarded PhD Programmes and Agreements.¹⁶

These include: jointly-awarded PhD programmes - the French-Australian PhD Cotutelle Programme, and the Universitas 21 (U21) Programme.

Other collaborative PhD programmes - Melbourne/Malaysia 'Split' PhD Partnership, The A*STAR Singapore Research Attachment Program, The CONACYT Mexico Joint Sponsorship Agreement and The CONICYT Chile Joint Sponsorship Agreement.

References

Australian Qualifications Framework Council (2011) *Australian Qualifications Framework, First Edition July 2011*, available at: www.aqf.edu.au/Portals/0/Documents/Handbook/AustQuals%20FrmwrkFirstEditionJuly2011_FINAL.pdf (last accessed 15 May 2012)

Evans, T, Evans, B and Marsh (2008) Australia in Nerad, M and Heggelund, M (2008) *Towards a Global PhD? Forces and Forms in Doctoral Education Worldwide*, University of Washington Press: Seattle and London

Green, H (2008) United Kingdom in Nerad, M and Heggelund, M (2008) *Towards a Global PhD? Forces and Forms in Doctoral Education Worldwide*, University of Washington Press: Seattle and London

Kehm, B (2008) Germany Nerad, M and Heggelund, M (2008) *Towards a Global PhD? Forces and Forms in Doctoral Education Worldwide*, University of Washington Press: Seattle and London

Kemp, N, Archer, W, Gilligan, C, and Humfrey, C (2008) *The UK's Competitive Advantage: The Market for International Research Students*, Universities UK, UK Higher Education International Unit: London

Lebel, J (2004) *Statistical Report 1990-2001*, Canadian Association for Graduate Studies: Ottawa

¹⁵ www.ors.ubc.ca/vpri/mobility-funding

¹⁶ www.gradresearch.unimelb.edu.au/future/jointphd.html

- Marr, K (2009) *Number of Postgraduate Research Students in Scotland, Targeting Innovation* Ltd: Glasgow
- Nerad, M and Heggelund, M (2008) *Towards a Global PhD? Forces and Forms in Doctoral Education Worldwide*, University of Washington Press: Seattle and London
- Nerad, M and Trzyna (2008) *United States of America in Nerad, M and Heggelund, M (2008) Towards a Global PhD? Forces and Forms in Doctoral Education Worldwide*, University of Washington Press: Seattle and London
- Ostriker, J P, Kuh, C V and Voytuk, J A (eds) (2011) *Committee to Assess Research-Doctorate Programs, US National Research Council: A Data-Based Assessment of Research-Doctorate Programs in the United States*. The National Academies Press: Washington, D C, available at: www.nap.edu/rdp (last accessed 15 May 2012)
- Quality Assurance Agency (2011) *Doctoral degree characteristics*, available at: www.qaa.ac.uk/Publications/InformationAndGuidance/Pages/Doctoral_characteristics.aspx (last accessed 15 May 2012)
- Quality Assurance Agency (2011) *The UK doctorate: a guide for current and prospective candidates*, available at: www.qaa.ac.uk/Publications/InformationAndGuidance/Pages/Doctorate-guide.aspx (last accessed 15 May 2012)
- Roberts, G (2002) *SET for success: The supply of people with science, technology, engineering and maths skills*, HM Treasury, UK Government: London
- Smith, A, Burnett, K, Purcell, W, Bradshaw, T, Docherty, D, and Worthington, S (2010) *One Step Beyond: Making the most of postgraduate education*, Department for Business, Innovation and Skills: London
- Vitae (2010) *Researcher Development Statement*, CRAC Ltd, available at: www.vitae.ac.uk/researchers/275981/Researcher-Development-Statement-RDS.html (last accessed 15 May 2012)
- Vitae (2010) *Researcher Development Framework*, CRAC Ltd, available at: www.vitae.ac.uk/researchers/428241/Researcher-Development-Framework.html (last accessed 15 May 2012)
- Williams, G (2008) *Canada in Nerad, M and Heggelund, M (2008) Towards a Global PhD? Forces and Forms in Doctoral Education Worldwide*, University of Washington Press: Seattle and London

Chapter 2 - Supporting diverse doctoral students and surveying the student experience

Two areas identified by the International Benchmarking Working Group (IBWG) as being of special interest are the experiences of international and part-time students taking Scottish doctoral degrees. This chapter considers the doctoral student experience in general, including student experience surveys, with separate sections addressing the part-time and international experiences.

2.1 Support for doctoral students, generally and in Scotland

The term '(doctoral) student experience' in this report is taken in its broadest sense to include everything from the student's first contact with an institution, their reception at the institution, the allocation of a research project, supervision and skills training, to the final award of the degree.

In the UK, the supervisory model for the doctorate has changed, moving over time from a very personal master/apprentice relationship between supervisor and student to a more complex, broader management model. The student is embedded in a department or graduate school which is often within a college or institutional graduate school. As mentioned above, in some cases the student is part of a centre for doctoral training or partnership.

A unique aspect of the Scottish postgraduate researcher experience is the Research Pools which give rise to a cross-institutional research specific graduate school. (Further details on Research Pools and graduate schools are given in chapter 4). In this wealth of support for students, where does the responsibility for the management of the research student lie?

The conclusion of the IBWG is that effectively a four-way 'contract' exists between student, supervisor, graduate school and institution, but legally the ultimate responsibility rests with the institution.

This 'contract' is underlying in Salzburg Principles ii, v and viii - Salzburg ii. 'Embedding in institutional strategies and policies: universities as institutions need to assume responsibility for ensuring that the doctoral programmes and research training they offer are designed to meet new challenges and include appropriate professional career development opportunities'; Salzburg v.

The crucial role of supervision and assessment: in respect of individual doctoral candidates, arrangements for supervision and assessment should be based on a transparent contractual framework of shared responsibilities between doctoral candidates, supervisors and the institution (and where appropriate including other partners) and Salzburg viii. The promotion of innovative structures: to meet the challenge of interdisciplinary training and the development of transferable skills.

In chapter 1, we refer to the Bologna Declaration and related frameworks for 'third cycle' qualifications. Included in these are the Salzburg Principles (EUA, 2005),¹⁷ supported by the Salzburg II recommendations (EUA, 2010), highlighting institutions' achievements in implementing the Principles.¹⁸

¹⁷ www.eua.be/eua/jsp/en/upload/Salzburg_Report_final.1129817011146.pdf

¹⁸ www.eua.be/Libraries/Publications_homepage_list/Salzburg_II_Recommendations.sflb.ashx

2.2 Student Experience Surveys

Results of student experience surveys could potentially provide quantitative evidence with which to benchmark 'the research degree student experience' internally within Scotland and may even become a useful enhancement tool for future developments. Further, if similar survey results were available from other countries, the results of these surveys and their comparisons might provide useful indicators of where Scotland sits in the international market as a 'research degree student experience' provider, and where action might be taken to enhance the nation's current position.

Results of surveys specific to Scotland

Number of Postgraduate Research Students in Scotland, a report for the Scottish Funding Council (SFC) by Ken Marr of Targeting Innovation (Marr 2009)

A survey of 1,526 current and past postgraduate research students (PGRs) was conducted by Targeting Innovation on behalf of SFC. Three-quarters of the PGR students surveyed agreed that their expectations have been well met. A further fifth stated that they had been somewhat met. The most dissatisfied PGRs were part-time students. Three-quarters of students surveyed felt integrated into their department community. However, part-time students felt least integrated in their department community, mostly linked to the nature of their mode of study.

The four most important factors identified by the group of PGRs in choosing an institution were the 'funding available', the 'reputation of the department' and the 'reputation of the institution', closely followed by the 'reputation of an individual professor'.

Individual Institutional Surveys

Many Scottish higher education institutions (HEIs) conduct internal surveys. The results of such surveys are available internally and will impact institutional action plans for enhancement of the PGR experience.

UK-wide Postgraduate Student Survey

The Postgraduate Research Experience Survey (PRES)¹⁹ is managed by the Higher Education Academy. Institutions 'opt in' to the survey - it is not compulsory. PRES runs biennially and is designed to collect information about what research postgraduates think about their experiences, the majority of whom are doctoral students. The most recent PRES ran from 1 March until 17 May 2011. The results of PRES are confidential to individual institutions and can be used to benchmark against the national UK sector aggregate and similar institutions (for example Russell Group, 1994 Group) by joining benchmarking clubs. However, of the 102 institutions who participated in PRES 2011, only eight (less than 50 per cent) Scottish HEIs took part. Hence there is neither 'Scottish-specific' quantitative data available nor a profile emerging to impact strategic enhancement of the research degree student experience in Scotland. However, there is a Scottish Benchmarking Club who may choose to share their aggregate data to influence the development of a Scottish PGR experience strategy.

¹⁹ Full PRES reports from 2007, 2008, and 2009 are available at: www.heacademy.ac.uk/resources/detail/postgraduate/pres-reports with a full report, executive summary and item scores for PRES 2011 at: www.heacademy.ac.uk/resources/detail/postgraduate/PRES_2011_report.

PRES is scheduled to run again in 2013. Assuming that the UK aggregate results are applicable and relevant to Scottish research students, the following extracts from the Executive Summary of PRES 2011 are relevant.

- Supervision was the scale that was rated as most important by respondents, as well as the area about which they were most positive.
- Transferable and research skills development were the two areas where respondents most felt that their expectations had been met or exceeded.
- Infrastructure was one of the least positive scales and, in particular, the availability of financial support.
- Intellectual climate was the second least positive scale for respondents and ratings were particularly low for the extent to which respondents felt integrated into their department's community.
- Professional development and career was the least positive scale of the survey and still the issue about which respondents expressed most concern.
- Respondents were unconvinced that their institution valued and responded to student feedback.
- Few respondents felt they had adequate opportunities to gain teaching experience and for those that had, there was a marked lack of positivity about the support and guidance they had received.
- The two most common motivations to pursue a research degree programme were an interest in the subject and improving academic or research career prospects.
- Just under half of respondents anticipated a career outside higher education.
- Respondents who identified themselves as having a disability were less positive across all areas of the survey.
- Students from Africa and Asia were in general most positive about their experience, while those from the UK, North America and the Middle East were less positive.
- Students funded by Research Councils UK (RCUK) were more positive about the provision of opportunities to develop research and transferable skills, but seemed to be markedly less positive than non-RCUK-funded students about the encouragement they had received to reflect on their professional and career development.

In order to capture 'Scottish-specific' quantitative data to impact strategic enhancement of the research degree student experience in Scotland, the working group consider it a priority for Scottish HEIs to work together to conduct a biannual Scottish postgraduate researcher survey of the postgraduate researcher community.

2.3 Supporting part-time students

While there has been a much larger increase in the number of students joining and studying on full-time than on part-time doctoral programmes (UK Council for Graduate Education, 2010), the experience of part-time students is a timely topic. Part-time research students are often working professionals who choose to undertake a doctorate for career and/or self-development. The part-time research student experience was considered by the working group as being very different from the traditional full-time

PhD experience, mainly due to students being off-campus and experiencing remote learning, and irregular, evening and weekend working hours, coupled with the difficulty of accessing supervisors in these unconventional hours.

Note: some of the examples of practice in Annex 4 are relevant to part-time, as well as international, students.

Scottish Part-time Researchers Conference

There are many opportunities for HEIs in Scotland to collaborate and pull together resources to enhance their student experience. This is actively encouraged by the Scottish Funding Council (SFC), Universities Scotland, Vitae Scotland, and Northern Ireland Hub. A good example of collaboration is the Part-time Researchers Conference Series that was initiated in 2010 and took place at the University of Edinburgh in 2010 and at the University of Strathclyde in 2011. Feedback from participants at the 2010 Conference was very favourable and gave an insight to the challenges of part-time doctoral researchers as detailed in the previous paragraph.

Example of practice - Part-Time Researchers Conference

The conference series was organised by a partnership between Vitae Scotland and Northern Ireland Hub, the Scottish Funding Council (SFC), the Department for Employment and Learning, and the University of Edinburgh, and in collaboration with HEIs across Scotland and Northern Ireland. It was designed with part-time researchers in mind to provide a full day of networking, professional development and career support for part-time PhD researchers and early career researchers. In 2010, it was located at the University of Edinburgh.

The event attracted over 200 notes of interest and 100 researchers were able to attend the event. Feedback was very positive.

This pilot project, informed by Postgraduate Research Experience Survey (PRES) and Careers in Research Online Survey (CROS) results, and meetings with staff supporting researchers, enabled Scottish and Northern Irish institutions to take steps forward in the provision of training and development opportunities targeted at part-time researchers. This was an entirely new venture in 2010, but due to the success the pilot model has been taken on by Vitae and they ran a second event in Strathclyde University in 2011.

While aimed at all early career researchers, the feedback from the event suggests the event was particularly appropriate for, and welcomed by, doctoral students across Scotland. This was initiated by the Institute for Academic Development at the University of Edinburgh (IAD), who are aware that support for part-time researchers is particularly difficult given the pressures on their time and the nature of their research. This was discussed with other universities at a Vitae Scotland Hub meeting. The issues faced across the region were consistent and the collaborative project of running a part-time PhD and early career researcher conference was established in 2009.

Rest of the UK

Vitae has undertaken a research and development project to explore the experience of part-time researchers. Findings suggest that many feel isolated and do not feel a part of the research community in which they operate. These observations present a considerable barrier to part-time researchers completing their doctorates and entering an academic career. As a result of this project, Vitae has produced a report, a training resource pack and a DVD for part-time PGRs and their supporters.²⁰

Most Vitae Regional Hubs either run or take part in training for part-time researchers.

The Vitae Hubs are - East of England Hub, London Hub, Midlands Hub, North West Hub, Scotland and Northern Ireland Hub, South East Hub, South West and Wales Hub, and Yorkshire and North East Hub.

2.4 Supporting international students

The Higher Education Statistics Agency (HESA) statistics (Figure 1) report that in 2001-02 students from outside the UK accounted for 36 per cent of all doctorates and in 2009-10 students from outside the UK accounted for 47 per cent of all doctorates. The quality of the experience of such students in terms of the intellectual climate, language, induction, cultural differences, and so on. in which they study and with which they engage is of major importance, as well as the benefits that international students can bring to the research communities of HEIs in Scotland. Given the increase in the number of international students studying for research degrees in Scotland, the working group agreed that sharing practice in terms of supporting international students would be highly valuable. Funding to encourage international PhD students to study in Scotland is also important, as many European HEIs are increasingly providing doctoral programmes in English and offering reduced fees or fee waivers.

Annex 4 provides details of several examples of practice in supporting international students through different models, in Scotland, elsewhere in the UK and Europe, and further afield.

United Kingdom

The British Council (BC) is the UK's international organisation for educational opportunities and cultural relations. Part of its remit is to create and foster links between researchers in the UK and around the world. As a product of Euraxess UK (part of the European Commission Euraxess services network), the BC has produced a very helpful booklet for international researchers entitled 'The guide for international researchers moving to the UK'. With this guide and the associated website,²¹ the BC hope to make the researcher's move to the UK easier.

The Higher Education Academy (HEA) project 'Teaching International Students' considers the issues for international students studying at postgraduate level in the UK. Postgraduate study, especially if it's research only, can be a very lonely experience for any student but far more so for international students. In the project, it is acknowledged that the right support from supervisors is crucial in the success of international research students.²²

²⁰ The materials produced by Vitae can be accessed through the following weblinks:
www.vitae.ac.uk/CMS/files/upload/Part-time%20researcher%20experience.pdf
www.vitae.ac.uk/CMS/files/upload/Part-time%20researchers%20briefing.pdf
www.vitae.ac.uk/policy-practice/95563/Part-time-researcher-film.html

²¹ www.britishcouncil.org/new/euraxess

²² Further information about the supervision of international students and the 'Teaching International Students' project is available at www.heacademy.ac.uk/teaching-international-students. The Academy Exchange No 9, April 2010 is completely devoted to the Postgraduate Student Experience: www.heacademy.ac.uk.

The work of the British Council and the Higher Education Academy in the UK is relevant for international doctoral students in Scotland.

The UK Council for International Student Affairs (UKCISA) is the UK's national advisory body serving the interests of international students and those who work with them. There are some interesting statistics on their website and helpful information for both overseas students in the UK and UK students looking to study abroad. While including some PGR statistics, their main focus is undergraduate students. Of the Scottish HEIs, only the University of Edinburgh (at position 6) appears in the top 20 largest recruiters in the UK of international students for 2009-10.²³

International Campuses and Collaboration

In order to increase the number of PGRs and their research capacity, many UK universities are forming strategic collaborations with international institutions. Initiatives include setting up international campuses and joint degrees. The following case studies report on UK experience in this area. The first example reports on the experience of the University of Plymouth in setting up partnerships to develop capacity in research excellence and supervision of PhD researchers in Europe. The second example reports on the three-centre international Graduate School of the University of Nottingham.

Collaborative practice

Example of practice - University of Plymouth

QAA Scotland, in collaboration with the Scottish Government, hosted an International Bologna Seminar entitled 'The 21st century doctorate - sharing European developments' on 18 March 2011 in Brussels.

At this event, Professor Mick Fuller, Chair of the UK Council for Graduate Education and Head of Graduate School and Director of Graduate Education, University of Plymouth, presented a workshop on 'Collaboration across Europe to grow capacity and meet a market demand'. Professor Fuller demonstrated the University's partnership working to develop pockets of research excellence and PhD supervision in Germany, Switzerland, Italy, UK, USA, and Canada. Each node is centred around a research topic that is relevant to one of Plymouth's Research Centres, and each PhD student at the node is supervised by an approved supervisor at the node and a remote supervisor at Plymouth. All students study in part-time mode as they nearly always have a job as well.

The students must meet together at specified times in a postgraduate symposium which is followed by supervision tutorials. Students must also travel to Plymouth on specified occasions. The great advantage of this approach is that it allows students to study for their doctorate at their home location where they are employed. The students get access to the electronic library at Plymouth and facilities at the node institution and have a sense of belonging to a Research Centre. For the University it increases the number of students and supervisors and opens up opportunities for joint research grants and research publications.

²³ www.ukcisa.org.uk/about/statistics_he.php

Multi-campus model

Example of practice - The University of Nottingham, an International University (Tessa Payne, Head of Graduate School, University of Nottingham and Jayne Wellens, Head of Research Development, University of Nottingham)

The University of Nottingham is truly an international University, having established campuses in Semenyih, Malaysia in 2000 and Nigbo, China in 2004. Both these international campuses award University of Nottingham degrees, contribute to research, teaching and internationalisation strategies, and contribute to all major University committees. While the majority of PGR students are based at the Nottingham campus, there is a significant and growing number of PGRs based in Malaysia and China (2,674 PGRs in Nottingham, 113 in Malaysia and 27 in China in 2010).

The University of Nottingham has been running a graduate school programme in research skills and techniques and transferable skills development since 1994. The UK provision has expanded and developed since 2002 in response to the Research Council's Joint Skills Statement and Roberts Funding. The programmes in the international campuses are based on this model, adapted for local delivery, student need and future career need. Some of the challenges encountered when rolling out the UK model to the international campuses have been around:

Student, supervisor and sponsor expectations - cultural differences, pedagogical approaches, transferable skills, familiarity with UK HE conventions.

Stages of development - staffing and developing local expertise/understanding, resources, infrastructure, funding, graduate school remit and local institutional needs, local student support, peer groups, Postgraduate Student Association (PGSA).

Communications - time differences, E-learning.

By combining graduate school structures and support across all three campuses that utilises a three-way transfer of staff and postgraduate student communication, there has been improved provision for all PGR students resulting in increased take-up and engagement.

Examples of activities that have taken place across all three campuses include: Building Experience and Skills Travel Scholarship Awards (BESTS), Research Showcase and an online literature review process course.

Emerging Markets in the UK - Professional Doctorates for Part-time and International Students

In the current financial climate, Scottish HEIs are required to generate income. One emerging market to consider is that of part-time and online provision of Professional Doctorates in Education or Business Administration. Two of the case studies in Annex 4 describe such programmes operating in the UK.

Aarhus University, Denmark

Another example in Annex 4 describes the experience of PGRs at Aarhus University in Denmark and explains the strategy and support for increasing the recruitment of international postgraduate students which is seen as a means to strengthening

the institution's international profile. Aarhus University has developed a structured PhD programme and require PGRs to achieve a mandatory European Credit Transfer System (ECTS) credit level. Aarhus recognises the competitiveness of the international market and have taken considered steps to address this: the majority of postgraduate programmes are taught in English and there are coherent measures in place to provide accessible support, both academic and non-academic, to international students and their families. International PGRs are actively supported and encouraged to integrate into the Danish higher education system and culture.

Further afield

Japan

The Japanese example in Annex 4 demonstrates the requirement by the University of Tokyo for international doctoral candidates to sit an entrance exam and to master Japanese prior to joining their PhD programme. The university also has a programme that allows PhD students from overseas universities to engage in specialised field research for six to 12 months in the University of Tokyo. (International Exchange programmes are considered more fully in chapter 5).

Australia

The Australian example of practice in Annex 4 provides details of an excellent mandatory research communication programme for international doctoral students currently operating at the University of Adelaide. One of the attractions of such a programme is its relevance and integration into the student's experience.

References

Higher Education Academy (2010) *Academy Exchange No9: The postgraduate student experience*, Higher Education Academy: York

Higher Education Statistics Agency (2011) Statistics online, available at: www.hesa.ac.uk (last accessed 15 May 2012)

Marr, K (2009) *Number of Postgraduate Research Students in Scotland*, Targeting Innovation Ltd: Glasgow

OECD (2010) *Careers of doctorate holders: Employment and Mobility Patterns STI Working paper 2010/4*, OECD: Paris, available at: www.oecd.org/sti/working-papers (last accessed 15 May 2012)

Postgraduate Research Experience Survey (2007, 2008, 2009), *Reports from Postgraduate Researcher Experience Surveys*, Higher Education Academy: York, available at: www.heacademy.ac.uk/resources/detail/postgraduate/pres-reports (last accessed 15 May 2012)

Postgraduate Research Experience Survey (2011), *Report from Postgraduate Researcher Experience Survey*, Higher Education Academy: York, available at: www.heacademy.ac.uk/resources/detail/postgraduate/PRES_2011_report (last accessed 15 May 2012)

Chapter 3 - Standards, Quality and Review

This chapter builds on some of the background information provided in chapter 1 and considers academic standards, quality and review procedures for doctoral degrees, including newer models. Here we recognise that multiple factors contribute to maintaining the standards and quality of doctoral education, hence the variety of topics identified by the International Benchmarking Working Group (IBWG) for inclusion in this chapter range from qualifications frameworks to the part played by assessment and external examiners, and by supervision and supervisors. We also touch on the challenges of joint degrees. Examples of structured doctoral education that help to maintain standards and quality are summarised in Annex 5.

3.1 Standards, quality and review - a Scottish and UK Perspective

As much of the guidance and regulation governing doctoral degrees is UK-wide, in this context it is not relevant to try to separate Scotland from the rest of the UK. For this reason, in this chapter we consider the Scottish doctoral experience within frameworks that apply UK-wide, where relevant highlighting areas specific to Scotland.

The Quality Assurance Agency for Higher Education (QAA) is responsible for assuring the standards, quality and review of doctoral education. The UK higher education sector's expectations for doctoral degrees are set out in Chapter B11: Research degrees of the UK Quality Code for Higher Education (the Quality Code) (to be published end of June 2012). This section of the Quality Code replaces the earlier *Code of practice for the assurance of academic quality and standards in higher education, Section 1: Postgraduate research programmes* (2004).²⁴

The areas covered by *Chapter B11: Research degrees* are: higher education provider arrangements, the research environment, selection, admission and induction of students, supervision, progress and review arrangements, development of research and other skills, feedback mechanisms, assessment, and student complaints and appeals.

As mentioned earlier, there has been increasing interest in the doctorate as a qualification in the UK. Brief details of this and of the diversification of the degree can be found in sections 1.3 and 1.4 of *Doctoral degree characteristics*.²⁵ There continues to be much discussion around the development and nature of the doctorate. In response to this debate, QAA has set up a website 'exploring the nature of 'doctorateness'. This website is rich in documentation relevant to current developments of the UK doctorate.

Doctoral degree characteristics: September 2011

www.qaa.ac.uk/Publications/InformationAndGuidance/Pages/Doctoral_characteristics.aspx

The doctoral qualification (podcast)

www.qaa.ac.uk/Publications/Podcasts/Pages/doctoral-qualification.aspx

Doctorateness - an elusive concept?

www.qaa.ac.uk/Publications/InformationAndGuidance/Documents/doctorateness.pdf

A Rough Guide to the UK doctorate: September 2011

www.qaa.ac.uk/Publications/InformationAndGuidance/Documents/RoughguideUKdoctorate.pdf

²⁴ Details about both documents can be found at:

www.qaa.ac.uk/Newsroom/PressReleases/Pages/Research-degrees-under-the-microscope.aspx.

Further information on the new Quality Code can be found at:

www.qaa.ac.uk/AssuringStandardsAndQuality/quality-code/Pages/default.aspx.

²⁵ www.qaa.ac.uk/Publications/InformationAndGuidance/Pages/Doctoral_characteristics.aspx

3.2 Quality and standards of a Scottish doctorate

In Scotland, all doctoral degrees fall within the guidance contained in the Framework for Qualifications of Higher Education Institutions in Scotland (FHEQS) (QAA, 2001),²⁶ forming part of the Scottish Credit and Qualifications Framework (SCQF).

Annex 1 to the FHEQS contains the doctoral qualification descriptor, which is reproduced in the box below and is identical to the descriptor for England, Wales and Northern Ireland (QAA, 2008).²⁷

In the England, Wales and Northern Ireland descriptor, some additional text (paragraphs 44 to 49 inclusive) augments the descriptor itself. This was added for greater clarification as a result of a small research project involving UK sector-wide consultation undertaken by QAA in 2007.

Doctoral degrees

SHE level D (SCQF level 12)

Credit definition: At least 540 credits of which a minimum of 420 are at SHE level D

Credit definitions do not apply to research-based doctorates.

General

The doctoral degrees are available through several different routes. The PhD is normally awarded following successful completion of a thesis which requires the equivalent of a minimum of three years' full-time research and study to complete. Professional doctorates also require the equivalent of three years' full-time research and study to complete and will frequently involve work-based as well as HEI-based research and study. Doctoral degrees reflect specialised and advanced knowledge, understanding and practice at the frontiers of the subject or professional area.

Characteristic outcomes of doctoral degrees

- i The creation and interpretation of new knowledge, through original research or other advanced scholarship, of a quality to satisfy peer review, extend the forefront of the discipline, and merit publication.
- ii A systematic acquisition and understanding of a substantial body of knowledge which is at the forefront of an academic discipline or area of professional practice.
- iii The general ability to conceptualise, design and implement a project for the generation of new knowledge, applications or understanding at the forefront of the discipline, and to adjust the project design in the light of unforeseen problems.
- iv A detailed understanding of applicable techniques for research and advanced academic enquiry.

Typically, holders of the qualification will be able to:

- a make informed judgements on complex issues in specialist fields, often in the absence of complete data, and be able to communicate their ideas and conclusions clearly and effectively to specialist and non-specialist audiences
- b continue to undertake pure and/or applied research and development at an

²⁵ www.qaa.ac.uk/Publications/InformationAndGuidance/Documents/FHEQscotland.pdf

²⁶ www.qaa.ac.uk/Publications/InformationAndGuidance/Pages/The-framework-for-higher-education-qualifications-in-England-Wales-and-Northern-Ireland.aspx

advanced level, contributing substantially to the development of new techniques, ideas, or approaches;

and will have:

- c the qualities and transferable skills necessary for employment requiring the exercise of personal responsibility and largely autonomous initiative in complex and unpredictable situations, in professional or equivalent environments.

Specification and criteria for a doctorate

Within the guidance specified in the doctoral qualification descriptor, the majority of Scottish universities have their own criteria for the award of a doctorate and as a minimum, require candidates to complete 'An independent piece of original research which makes a significant contribution to the field', or words to that effect.

Institutional regulations usually reference other issues such as duration of period of study - minimum and maximum (for example 36 months minimum or 48 months maximum full-time, with corresponding part-time periods), payment of fees, length of thesis, and regulations about how the thesis is to be presented. In addition to these university regulations there may be further requirements stipulated in college/faculty/school/department booklets which reflect the nature of the doctorate being studied.

Rather than have one set of regulations covering all doctorates, Scottish HEIs generally treat each one as an individual entity. The newer HEIs look to the new doctorates for development of research in their institutions, and the more research-intensive HEIs hold fast to the traditional PhD while developing new doctoral programmes to meet market demand. An example of such a development is the Education Doctorate at the University of Edinburgh which is similar to those found in other UK universities, for example at the Institute of Education in London.

Physics example

A review of the admission, progression, supervision and assessment procedures across eight Scottish universities for researchers to graduate with a PhD in Physics reveals a broadly similar, but not identical, matrix (see Figure 3). Hence, even in one specific subject area, there are differences in requirements among institutions, even though university-level criteria broadly match those in the qualification descriptor above. There is a degree of commonality in areas such as entrance qualifications for all applicants and language requirements for overseas students, with greater flexibility sometimes permitted in exceptional cases. Progression procedures of the eight institutions vary but are in alignment with QAA expectations and guidance.

Figure 3: Requirements across eight Scottish universities for researchers to graduate with a PhD in Physics

3.3 Scottish universities alignment with sector-wide guidelines for doctoral education

	Entrance Requirements (including language requirements)							
Edinburgh	Degree: Minimum 2:1 first degree (2:2 if student has an MSc). A 2:2 (or 3rd) exceptionally acceptable if the student can demonstrate special circumstances at examination time and has done extremely well in proposed PhD subject area.	University of the West of Scotland (UWS)	St Andrews	Glasgow	Strathclyde	Aberdeen	Heriot Watt (HWU)	Dundee
	Degree: Good honours degree, normally first or 2:1. Language: International English Language Testing System (IELTS) average score of 6 or above (with a score of 5 or above on each component).	Degree: 1st class (>50% of entrants have this) or 2:1 with good project. Language: By interview.	Degree: BSc Hons 2:1 (rare exceptions allowed pending approval by HOD), Language: IELTS 6.0 (if not met: compulsory English courses and conditional acceptance - this is very rare)	Degree: Minimum 2:1; BSc/MPhys, or a combination of qualifications and/or experience equivalent. Language: 7.0 IELTS, 280 TOEFLS (internet based), 650 TOEFLS (paper based)	Degree: 2:1 or above; Language: IELTS 6.5; TOEFL 580/ CB 237	Degree: 1st class or 2:1 honours degree, or a master's qualification of equal or higher standard in a relevant subject. Language: One of the following: A degree done in English, HWU's Foundation English Programme - Grade C, TOEFL 550 (213 in the computerised test or 80 in the internet-based test), IELTS 6.5, Cambridge Certificate of Proficiency (CPE) Grade C		Degree: 2:1 honours degree (or equivalent) in a relevant subject, or a relevant master's qualification (or equivalent) where appropriate. (Some exceptions possible.) Language: 6.0 at IELTS (or equivalent English coursework at Dundee).

Duration of PhD (minimum and maximum)	MPhil/PhD Registration: Full-time: min: 33, max: 72; Part-time: min: 45, max: 72; PhD Direct Registration: Full-time: min: 24, max: 72; Part-time: min: 36, max: 72.	Usually 3.5 years, with a 6 month write-up. (4 years total).	Min: 36 months, Max: 48 months (with "due cause" and permission of Faculty Graduate School can be extended)	Full-time: Min 33 months, Max: 48 months	Full-time: Min 36 months.	Full-time: min: 24 months, max: 5 years; Part-time: min: 3 years, max: 8 years (6 years for MPhil)	Min: 3 years, Max: 4 years (6 years Part-time); Extensions possible if university procedures followed.
Flexible or Part-time Options	Yes.	Yes, but no students currently exercising this option.	Any reasonable proposal considered, from 50% up (option rarely used)	Equivalent of full-time study period taking account of the conditions under which the student will work.	Part-time options available.	Yes, part-time and distance learning available.	Part-time options available.
Taught Coursework Requirements and/or Roberts Requirements	Vary depending on subject area. In line with the Research Councils' recommendations training is provided for research students in areas such as career development, networking and team-working, communication skills, and research management.	40 hours of SUPA courses, additional Roberts requirements are provided by local Gradskills programme.	40 hour SUPA requirement, plus any courses supervisor deems essential (mainly in PP/NP) About 2 weeks (70 hours) 'Roberts' activities per year (required in 1st year, then monitored in 2nd year and beyond).	Attainment of at least 30 credits	40 hours of SUPA courses, additional Roberts requirements are provided by local Gradskills programme.	40 hour SUPA requirement. 80 hours of skills training (including writing and presentation skills) during each year of their course of study.	Postgraduate Induction Course [PIC] and 2 weeks of Generic Skills Courses every year
Min: 36 months, Max: 48 months	MPhil/PhD Registration: Full-time: min: 33, max: 72; Part-time: min: 45, max: 72; PhD Direct Registration: Full-time: min: 24, max: 72; Part-time: min: 36, max: 72.	Usually 3.5 years, with a 6 month write-up. (4 years total).	Min: 36 months, Max: 48 months (with "due cause" and permission of Faculty Graduate School can be extended)	Full-time: Min 33 months, Max: 48 months	Full-time: Min 36 months.	Full-time: min: 24 months, max: 5 years; Part-time: min: 3 years, max: 8 years (6 years for MPhil)	Min: 3 years, Max: 4 years (6 years Part-time); Extensions possible if university procedures followed.
Flexible or Part-time Options	Yes.	Yes, but no students currently exercising this option.	Any reasonable proposal considered, from 50% up (option rarely used)	Equivalent of full-time study period taking account of the conditions under which the student will work.	Part-time options available.	Yes, part-time and distance learning available.	Part-time options available.
Taught Coursework Requirements and/or Roberts Requirements	Vary depending on subject area. In line with the Research Councils' recommendations training is provided for research students in areas such as career development, networking and team-working, communication skills, and research management.	40 hours of SUPA courses, additional Roberts requirements are provided by local Gradskills programme.	40 hour SUPA requirement, plus any courses supervisor deems essential (mainly in PP/NP) About 2 weeks (70 hours) 'Roberts' activities per year (required in 1st year, then monitored in 2nd year and beyond).	Attainment of at least 30 credits	40 hours of SUPA courses, additional Roberts requirements are provided by local Gradskills programme.	40 hour SUPA requirement. 80 hours of skills training (including writing and presentation skills) during each year of their course of study.	Postgraduate Induction Course [PIC] and 2 weeks of Generic Skills Courses every year

Supervision (number of supervisors and minimum supervision requirements)		Progression to PhD	
Two supervisors: 1 main and 1 assistant. Occasionally only one or up to 3 (1 main and 2 assistant) in some subject areas and for some CASE students.	At least two (first and second supervisor). The first supervisor is mainly responsible for the student's supervision with the second supervisor acting in an advisory role. One member of the supervisory team must have previously supervised a PhD student to completion. The supervisory team must be approved by the Research Degrees Committee before an offer can be made to the student.	Formally 2; 1 Supervisor + 1 2nd Advisor/ Mentor.	Minimum 2 supervisors. Where student is >50% in P&A, there may be 2 in P&A plus another in the other Department/ University.
		2 supervisors (Faculty approved); Supervisor expected to arrange regular contact with student and be accessible at other times as appropriate; 2nd supervisor expected to deputise in event of any extended planned or unplanned absence of 1st supervisor.	2 supervisors; 1st supervisor must be a member of staff, 2nd supervisor can be external
		Two supervisors (at least one must be member of the academic staff of the School).	2 Supervisors (Principal and Second)
		Progression based on annual appraisal (see below).	Must complete a 'relevant body of work' (such as report or presentation) at 9 months to transfer from 'Research Student' to 'PhD Student.'
		MSc with transfer to PhD; Transfer is considered after successful completion of 9 month assessment.	
		1st year: satisfactory report + viva; 2nd year : satisfactory presentation (including thesis plan) + viva; Quarterly progress checks in 1st year; 6-month checks from then on.	
		System is flexible: progression year to year is based on supervisors' recommendations. Some students are admitted to MSc with performance requirements for progress, but in most cases it is expected that they will study towards PhD. Few students (>1%) fail to progress to the PhD at end of year 1	
		Direct registration for PhD is the norm, although the MPhil route is taken sometimes. Decision about progression is taken at 1st year review (early June)	
		Students initially registered for MPhil. Progression to PhD following a Transfer Event which consists of a written report, an oral presentation, and a viva. The Transfer Event usually happens at the end of the student's first year of study.	
		All students registered as PhD on arrival. Re-registration to MPhil can occur if student is not progressing well or wishes to change to this degree.	

Means of Assessment during PhD studies (type of Assessment and guidelines)							
6 months: pastoral interview; 9 months: 1st year review; 18 months: 2nd year report; 24 months: 2nd year poster; 30 months: 3rd year report unless student is approaching submission	Several assessed lecture courses (vary between research areas). Students are required to fill in Progression Forms at 12 weeks, 6 months, 12 months and thereafter, annually.	1st year report, 2nd year talk, 3rd year poster, All followed by interview with 2 assessors (2nd Supervisor + 1 other)	Supervisor's reports. Student's reports at end of years 1 and 2. Attendance of certain compulsory Roberts' activities (a Faculty requirement). (Supervisors are instructed to take account of performance in SUPA courses when grading students at the end of the year)	Taught courses : written exam or continuous assessment; 1st year report + viva; 2nd year presentation + viva	Assessment in the form of a report and viva takes place after 9 months of study. After 21 months of study an interview and report is required.	Taught modules, skills training and annual appraisal. Appraisal forms completed by student, supervisor(s), and an independent assessor. A report is required at end of first year of PhD (second year part-time). At end of the second year of a PhD (fourth year part- time), report requirement is waived if a copy of a submitted scientific paper is provided.	Biannual meetings with a Thesis Monitoring Committee (2 academics, neither of which is the principal supervisor)
Thesis and viva. Thesis is 100,000 words max. (recommended not to exceed 70,000 words).	Thesis and viva. Viva with at least one internal and external examiner. Maximum length for the thesis is 40,000 words.	Thesis + viva as usual.	Thesis and viva.	Thesis + viva (external examiner, internal examiner + convenor); Word limit <100,000 words unless permitted to exceed by Faculty Board of Study.	Thesis and viva with external examiner and internal examiner	Thesis (max. 80,000 words unless special arrangements made)	Thesis and viva.

Final Assessment

Scottish HEIs (like HEIs in other parts of the UK) are expected to adhere to the Expectation and Indicators set out in Chapter B11: Research degrees of the Quality Code. Alignment with the Quality Code is considered during the Enhancement-led Institutional Review (ELIR). Paragraphs 41 to 43 of the 2008 ELIR Handbook deal with the scope of ELIR and emphasise that this includes **all** students on **all** credit-bearing provision. The second sentence of paragraph 41 states: 'ELIR therefore relates to the learning experience of all students on credit-bearing provision: undergraduate and postgraduate students; taught and research students...'.²⁸

The extent to which ELIR teams focus on research provision or the learning experience of doctoral students depends on a range of factors including: the overall balance of issues in the ELIR; the strengths and weaknesses of the HEI's approach to managing that area of activity (if there is nothing exceptional in that area, the team will not give it particular priority but they will, at least, seek to check that threshold matters are secured, including adherence to the Quality Code); and the HEI's strategic intentions for that area. The majority of ELIR reports include explicit text relating to research students and the support provided to them by the institution.

The rigour of HEIs' arrangements for reviewing their doctoral degree provision is a core element of ELIR. Unlike the case with taught provision, where there is SFC guidance, there is no sector-wide agreed approach to reviewing research provision separately. This is an area for possible further development work with the sector. While maintaining their autonomy, Scottish institutions should perhaps become more systematic about self-review and enhancement of the doctoral experience.

3.4 Academic standards, quality assurance, enhancement and review of doctoral education at international level

Europe

As mentioned briefly in chapter 1, the Framework for Qualifications of the European Higher Education Area (EHEA), was developed as part of the Bologna Process and sets the standards for all levels of degrees, including doctorates, Europe-wide.²⁹

Scotland, like the rest of the UK, has been through a process of verification of its qualifications framework, whereby independent assessors concluded that it is in alignment with the EHEA Framework, helping to assure consistent academic standards among European higher education institutions.

Another key document arising from European cooperation is the summary of the Salzburg Principles.³⁰ The principles themselves are relatively brief and are as follows.

²⁸ The ELIR Handbook (2008) can be accessed at: www.qaa.ac.uk/Publications/InformationAndGuidance/Documents/ELIRHandbook2008.pdf.

²⁹ Further information about Bologna and the third cycle qualification can be accessed at: www.ond.vlaanderen.be/hogeronderwijs/bologna. This is the official website of the Bologna Process for the period 1 July 2007 until 30 June 2010. Information on related activities and archived Bologna information can be found at: www.ehea.info.

³⁰ www.eua.be/eua/jsp/en/upload/Salzburg_Report_final.1129817011146.pdf

Conclusions and Recommendations from the Bologna Seminar on 'Doctoral Programmes for the European Knowledge Society' (Salzburg, 3-5 February 2005)

- i The core component of doctoral training is the advancement of knowledge through original research: at the same time it is recognised that doctoral training must increasingly meet the needs of an employment market that is wider than academia.
- ii Embedding in institutional strategies and policies: universities as institutions need to assume responsibility for ensuring that the doctoral programmes and research training they offer are designed to meet new challenges and include appropriate professional career development opportunities.
- iii The importance of diversity: the rich diversity of doctoral programmes in Europe - including joint doctorates - is a strength which has to be underpinned by quality and sound practice.
- iv Doctoral candidates as early stage researchers: should be recognised as professionals - with commensurate rights - who make a key contribution to the creation of new knowledge.
- v The crucial role of supervision and assessment: in respect of individual doctoral candidates, arrangements for supervision and assessment should be based on a transparent contractual framework of shared responsibilities between doctoral candidates, supervisors and the institution (and where appropriate including other partners).
- vi Achieving critical mass: Doctoral programmes should seek to achieve critical mass and should draw on different types of innovative practice being introduced in universities across Europe, bearing in mind that different solutions may be appropriate to different contexts and in particular across larger and smaller European countries. These range from graduate schools in major universities to international, national and regional collaboration between universities.
- vii Duration: doctoral programmes should operate within an appropriate time duration (three to four years full-time as a rule).
- viii The promotion of innovative structures: to meet the challenge of interdisciplinary training and the development of transferable skills.
- ix Increasing mobility: Doctoral programmes should seek to offer geographical as well as interdisciplinary and intersectoral mobility and international collaboration within an integrated framework of cooperation between universities and other partners.
- x Ensuring appropriate funding: the development of quality doctoral programmes and the successful completion by doctoral candidates requires appropriate and sustainable funding.

Salzburg II provides recommendations and comment on institutions' achievements in implementing the original Salzburg Principles.

The Salzburg II Recommendations are very clearly a set of guidelines rather than a checklist of requirements, demonstrating the difference between the development of doctoral education and that of the first and second cycles (bachelors and master's degrees). The first Salzburg Principle clearly concurs with the ethos of the PhD minimum

requirement given at the beginning of this chapter. It states 'The core component of doctoral training is the advancement of knowledge through original research'. The Salzburg Principles and Salzburg II are both relevant to the enhancement of the postgraduate experience in Scotland. This is as a consequence of the Scottish Government's commitment to the already mentioned 'Bologna Declaration', an agreement originally signed in 1999 covering equivalencies of bachelors and master's degrees, now extending to 47 countries and to the third cycle - doctorate degrees.

The European Universities' Association (EUA) has stewardship of the Salzburg Principles on behalf of the EHEA. The role of the EUA's Council for Doctoral Education (EUA-CDE) is one of enhancement in that it contributes much to the development, advancement and improvement of doctoral education through organising Europe-wide events to share and develop practice and holding an annual conference open to non-members. The majority of institutions who are members of the EUA-CDE are in continental Europe but the number of UK members is growing.³¹

European examples of practice

Examples from Europe - the Netherlands and Ireland - summarised in Annex 5 present evidence of doctoral systems that have been recently revised to introduce a very structured element in their approach. They are included here rather than in the section about models of doctoral education outlined in chapter 1 because they demonstrate that the structure introduced has a key part to play in managing doctoral education and maintaining quality, as well as encouraging effective supervision and timely completion. Both examples show evidence of strict monitoring by graduate schools and research schools of quality - initial proposal, progression and supervision; with a significant taught course component.

North America

In North America, the Council of Graduate Schools (CGS) has been supporting graduate development for over 50 years. The Council of Graduate Schools (CGS) is an organisation of over 500 institutions of higher education in the United States and Canada engaged in graduate education, research, and the preparation of candidates for advanced degrees.

The organisation's mission is to improve and advance graduate education, which it accomplishes through advocacy in the federal policy arena, research, and the development and dissemination of best practices.

In July 2011, CGS released a new publication: 'Global Perspectives on Measuring Quality: Proceedings of the 2010 Strategic Leaders Global Summit on Graduate Education'. The book contains brief essays by the 43 Global Summit participants representing 17 countries; the proceedings examine the benefits and challenges of assessing the quality of master's and doctoral programs in different global regions while highlighting international best practices in measuring quality.

As a consequence of the generality of the American undergraduate degree, the American doctorate has always had an intense taught component (typically one to two years full-time) and the American PhD has been much longer than the Scottish equivalent. A Commission on the Future of Graduate Education in the United States has been set up

³¹ Further information about EUA-CDE can be found at: www.eua.be/cde/Home.aspx.

as a joint venture between the CGS and the Educational Testing Service (ETS). In April 2010, this consortium produced a national report, 'The Path Forward: The Future of Graduate Education in the United States (2010)'.

This report considers the current position in the USA and makes recommendations for future developments. One year on, CGS have produced a report, 'Steps Taken on the Path Forward'.³³

Australia

In Australia (and New Zealand), the quality of qualifications is controlled by the Australian Qualifications Framework (AQF).³⁴

The first edition of the Framework was published in July 2011 after thorough international and Australia-wide consultation. Like the UK's qualifications frameworks, the AQF is based on programme learning outcomes rather than time to degree, and separates doctorates into two categories: the doctoral degree (research) and the doctoral degree (professional). However, as in the UK and the rest of Europe, academic standards and quality of doctoral qualifications are set at equivalent levels and the difference between the two AQF categories is mainly to distinguish professional skills and attributes arising from practice-based and professional doctorates.

The Australian Universities Quality Agency (AUQA) is responsible for the external monitoring of the quality of issuing organisations that are self-accrediting.

The title used for doctoral qualifications (research or professional) must be consistent with the AQF Qualifications Issuance Policy. Each qualification accredited as a doctoral degree must include documented pathways consistent with the AQF Qualifications Pathways Policy. Issuing organisations offering a doctoral degree qualification must meet the requirements of the AQF Qualifications Pathways Policy.

New Zealand

An outline of the New Zealand PhD Structure (attributed to Luanna H. Meyer, Victoria University of Wellington, New Zealand).

Provisional status: Supervision meetings and development of research proposal (six to 12 months), submitted for internal formal review, revisions overseen by faculty assoc dean, public proposal presentation - six-monthly reports monitored.

Full registration: Thesis research and writing (two to three years), ethics review, regular supervision meetings - six-monthly reports monitored.

Thesis Examination: 100,000 word thesis examined by internal, external, and overseas examiners (N=3).

Oral examination: Chaired by Dean FGR Nominee, candidate questioned by examiners, supervisors in attendance.

An example - PhD Social Sciences Best Practices at Victoria

Candidate's topic matches strategic priorities and expertise available within the faculty Two supervisors (PhD level, experienced) - matched for topical and methodological expertise.

³³ www.cgsnet.org/steps-taken-path-forward

³⁴ www.aqf.edu.au

Minimum resources agreement: Office with computer, \$2,000 annual eligibility for each of three years to support PhD and research (maximum \$6,000).

Coursework permissible (maximum of .50 EFTS) related to research (for example, advanced quantitative or advanced qualitative methods).

Doctoral cohort participation and access to research PhD workshops.

3.5 Supervision and Supervisors

As is made clear by QAA in *Chapter B11: Research degrees* of the Quality Code, 'the student-supervisor relationship is of paramount importance in all research degrees'. The quality and effectiveness of supervision affects almost every element of the doctoral student experience and is therefore an important factor in maintaining academic standards and the quality of doctoral education. The 'Indicators' of high quality supervision expected by the UK higher education sector are set out in more detail in the current version of *Chapter B11* of the Quality Code.³⁵

Looking further afield, this next example of practice describes a very useful resource that was developed 12 years ago but is still very relevant to supervisor training today. In discussion with the IBWG, it appears that a significant challenge in training supervisors is that of getting supervisors to attend training sessions. Many new supervisors claim to be too busy to attend and more experienced supervisors often don't see the relevance of updating their training. Perhaps Scottish HEIs should consider making initial supervisor training mandatory before supervision can commence and supplementing initial training with regular updates that are also mandatory. This University of Melbourne 'supervisor's manual' could be used during face to face training or developed as an online resource.

Example of practice - the University of Melbourne

In 1999, the University of Melbourne produced a very informative document on supervision for supervisors of research degree candidates entitled 'Eleven practices of effective postgraduate supervisors' by Richard James and Gabrielle Baldwin.³⁶

While published in 1999, it is entirely relevant for today's supervisors. With 11 sections in total, it is split into three parts - Foundation, Momentum and Final Stages. The sections are as follows: Foundation - ensure the partnership is right for the project, get to know students and carefully assess their needs, establish reasonable agreed expectations, work with students to establish a strong conceptual structure and research plan; Momentum - encourage students to write early and often, initiate regular contact and provide high quality feedback, get students involved in the life of the department, inspire and motivate, help if academic and personal crises crop up; Final Stages - take an active interest in students' future careers, carefully monitor the final production and presentation of the research.

³⁵ www.qaa.ac.uk/Publications/InformationAndGuidance/Pages/research-degrees-draft-for-consultation.aspx.

³⁶ www.cshe.unimelb.edu.au/resources_teach/teaching_in_practice/docs/11practices.pdf

References

Council of Graduate Schools (2010) *The Path Forward: The Future of Graduate Education in the United States*, USA Government, Washington

Council of Graduate Schools (2011) *Global Perspectives on Measuring Quality: Proceedings of the 2010 Strategic Leaders Global Summit on Graduate Education*. Council of Graduate Schools, Washington

Council of Graduate Schools (2011) *Steps Taken on the Path Forward*, Council of Graduate Schools, USA

Irish Universities Quality Board (2009) *Good Practice in Organising PhD Programmes in Irish Higher Education*, available at: www.iuqb.ie/info/good_practice_guides.aspx (last accessed 15 May 2012)

James, R and Baldwin, G (1999) *Eleven practices of effective postgraduate supervisors*, available at: www.cshe.unimelb.edu.au/resources_teach/teaching_in_practice/docs/11practices.pdf (last accessed 15 May 2012)

European Universities Association - Council for Doctoral Education (EUA-CDE) (2005) *Report of Bologna Seminar original 'Doctoral programmes for the European Knowledge Society'* Salzburg principles, 2005

EUA-CDE (2011) Salzburg II (Salzburg II provides evidence and recommendations about implementation of the original Salzburg principles), available at: www.eua.be/eua/jsp/en/upload/Salzburg_Report_final.1129817011146.pdf (last accessed 15 May 2012)

Quality Assurance Agency (2001) *The framework for higher education qualifications in Scotland*, available at: www.qaa.ac.uk/Publications/InformationAndGuidance/Pages/FHEQ-Scotland.aspx (last accessed 15 May 2012)

Quality Assurance Agency (2004), *Code of practice for the assurance of academic quality and standards in higher education, Section 1: Postgraduate research programmes*, available at: www.qaa.ac.uk/Publications/InformationAndGuidance/Pages/Code-of-practice-section-1.aspx (last accessed 15 May 2012)

Quality Assurance Agency (2008) *The framework for higher education qualifications in England, Wales and Northern Ireland*, available at: www.qaa.ac.uk/Publications/InformationAndGuidance/Pages/The-framework-for-higher-education-qualifications-in-England-Wales-and-Northern-Ireland.aspx (last accessed 15 May 2012)

Quality Assurance Agency (2011) *Chapter B11: Research degrees* of the UK Quality Code for Higher Education (under consultation, final version to be published June 2012), draft available at: www.qaa.ac.uk/Publications/InformationAndGuidance/Pages/research-degrees-draft-for-consultation.aspx (last accessed 15 May 2012)

Quality Assurance Agency (2011) *Doctoral degree characteristics*, available at: www.qaa.ac.uk/Publications/InformationAndGuidance/Pages/Doctoral_characteristics.aspx (last accessed 15 May 2012)

Quality Assurance Agency (2008) *Enhancement-led institutional review handbook: Scotland*, available at: www.qaa.ac.uk/Publications/InformationAndGuidance/Pages/Enhancement-led-institutional-review-handbook-Scotland.aspx (last accessed 15 May 2012)

Research Councils UK (2001) *Joint Statement of the UK Research Councils' Training Requirements for Research Students*, available at: www.vitae.ac.uk/cms/files/RCUK-Joint-Skills-Statement-2001.pdf (last accessed 15 May 2012)

Scottish Credit and Qualifications Framework (2001) *SCQF Level Descriptors*, available at: [www.scqf.org.uk/content/files/SCQF_Level_Descriptors_for_website_-_Feb_2010\(2\).pdf](http://www.scqf.org.uk/content/files/SCQF_Level_Descriptors_for_website_-_Feb_2010(2).pdf) (last accessed 15 May 2012)

Chapter 4 - Developing and supporting critical mass and diversity

This chapter considers different models for developing critical mass and diversity. Of particular interest to the group were: collaboration and graduate school models; centres for doctoral training; and inter and intranational graduate schools.

4.1 Graduate schools

Graduate schools started in North America in the 1960s and over the last 50 years have had a major impact on the structuring and development of graduate schools in Scotland, the rest of the UK, Europe and Australasia. An important differential, however, when reviewing doctoral and graduate school models, is the entrants' undergraduate experience and in particular the variation of length and intensity of undergraduate programmes and consequent impact on the postgraduate model.

National coordinating organisations in North America, the UK and Australia

Graduate schools in the United States of America are supported by the Council of Graduate Schools (CGS) and in Canada by the Canadian Association of Graduate Schools (CAGS), both very powerful organisations. There is no such body in Scotland or indeed the UK.

In Europe, doctoral education is supported by the work of the European Universities Association - Council for Doctoral Education (EUA-CDE); in the UK both the UK Council for Graduate Education (UKCGE) and Vitae support postgraduate education and influence policy and development. In Australia, the Council of Deans and Directors of Graduate Studies (DDoGS) are the bodies that supports and controls the national development of graduate education.

Richness and diversity

'A Review of Graduate Schools in the UK' (UKCGE 2010), demonstrates the richness and diversity of different models for graduate schools within the UK HEI sector. This supports the Salzburg principle vi and corresponding Salzburg II Recommendations as outlined in the previous chapter.

vi Achieving critical mass: Doctoral programmes should seek to achieve critical mass and should draw on different types of innovative practice being introduced in universities across Europe, bearing in mind that different solutions may be appropriate to different contexts and in particular across larger and smaller European countries. These range from graduate schools in major universities to international, national and regional collaboration between universities.

Scotland

In Scotland, there are broadly two types of graduate school - research schools that are subject-specific; and cross-disciplinary transferable skills graduate schools created in response to the Roberts' agenda. The remit of graduate schools is to provide education and training for a critical mass of doctoral candidates (sometimes also including research master's students), and to provide administrative support for successful completion of

the doctoral process - recruitment, progression and completion. In general, research schools support the critical mass agenda and cross-disciplinary graduate schools support the diversity agenda. However, across Scotland's 20 HEIs, there is much diversity in graduate school models. In the larger institutions, for example, graduate schools may potentially exist at three levels - at the subject-specific layer or 'unit' level, at school, faculty or college level and finally at institutional level. In the medium-sized institutions, only two graduate schools may exist - at college and/or faculty level and the overarching institutional graduate school. In the smaller institutions, there is generally only one institutional cross-disciplinary graduate school.

4.2 Research pooling and collaborative graduate schools

A unique added dimension for Scotland is that of research pooling where each of the research pools has a subject-specific graduate school (or research school) that interfaces with local institutional graduate school(s). While research pools add to the richness of doctoral education and training and the critical mass agenda, they also introduce a further layer of complexity.

An estimation of the number of graduate schools in Scotland potentially could be as many as 120, composed of pools (10), institutions (20), faculties/colleges (30), and schools/departments (60). This would lend itself to some rationalisation; a possible step towards this has been identified in the rationalisation of transferable skills provision as outlined in the 'CHORUS' proposal in chapter 5.

The research pooling initiative was created by the Scottish Funding Council (SFC) in 2003 to encourage researchers across Scottish higher education to pool their resources and respond to international competition. The concept behind these research pools is that dynamic collaborations between research departments can provide Scotland's universities with a competitive advantage which other countries would find difficult to replicate. With 20 closely connected universities and a tradition of academic collaboration, Scotland is a well connected hub of world-leading research. Included in research pooling initiatives are the Scottish Universities Physics Alliance (SUPA), the Scottish Universities Life Sciences Alliance (SULSA), the Scottish Informatics and Computer Science Alliance (SICSA), and the Scottish Imaging Network: a Platform for Scientific Excellence (SINAPSE). Information about the SUPA Graduate School and the Scottish Graduate School of Social Science (funded by the Economic and Social Research Council (ESRC)) can be found in Annex 5.

4.3 Centres for doctoral training

Centres for doctoral training, or doctoral training centres (DTCs) were first introduced by the Engineering and Physical Sciences Research Council (EPSRC), targeted to produce a critical mass of doctoral graduates in specific EPSRC priority disciplinary areas. DTCs give students the opportunity to develop and carry out their PhD-level research with the added benefit of taught courses to give them a solid background in and knowledge of their chosen discipline. The diversity and development of the EPSRC DTC concept is demonstrated by the current EPSRC portfolio which includes Basic Technology DTCs, Securing the Future Centres, Industrial Doctorate Centres, Digital Economy Centres, Energy Centres, Nano-application Centres, Complexity Science Centres and Life Sciences Interface Centres. The current portfolio of EPSRC DTCs includes 45 new centres

approved in 2008 with formal start dates of 1st October 2009 and 17 centres - largely in the life sciences cross-disciplinary interfaces (LSI) - which have been in place for several years. Of the new centres, four are based in Scotland and Scottish universities are partners in two out of the three recently formed EPSRC Basic Technology DTCs.

Annex 6 provides details of UK DTCs in different subject areas. The doctoral training centre concept has now been adopted by all the UK research councils, for example the ESRC as previously described, where the ESRC Doctoral Training Centre in Scotland is integrated into The Scottish Graduate School of Social Science. In March 2011, the Biotechnology and Biological Sciences Research Council (BBSRC) announced its scheme for Doctoral Training Partnerships (DTPs), similar to that of the EPSRC and ESRC DTCs. A mandatory requirement for studentships funded under the BBSRC DTP programme is the requirement for doctoral candidates to participate in a three-month professional internship during their PhD. This will strengthen the employability agenda and in particular deepen the awareness of employers to doctoral candidates and their skills and attributes, and widen the experience of candidates, beyond academia, to the types of careers in which their research training could have an impact.

Further examples of DTCs are available from the EPSRC and ESRC websites and information on the call for the BBSRC DTPs can be viewed on the BBSRC website.

4.4 Examples of practice in building critical mass and diversity

Europe (non-UK)

In Europe changes to doctoral education are being driven both by legislation and competitive funding initiatives. As in the UK, there are many and varied models working to build critical mass and diversity within the doctoral community. These include networks between universities, research excellence models similar to that of research pooling in Scotland and also multidisciplinary models. Common to all models is the enhancement of good practice in researcher development leading to an increase in research excellence for the individual, the institution, the network and the country.

Marie Curie and Erasmus Mundus

In Europe, Erasmus Mundus (2009-13) funding for networks supports joint doctoral programmes through network funding. The ENC network is a good example of this working in practice with a three-year joint PhD programme in Neuroscience specialisation and training in academic skills. It builds on two Marie Curie Initial Training Networks (ITNs) BrainTrain and SymBad and newly developed courses from the ENC-Network and its partners: Neuroscience Campus Amsterdam, Bordeaux Neuroscience - Université Bordeaux, Segalen European Neuroscience Institute, Göttingen Neuroscience Center, Zurich Center for Neuroscience and Cell Biology, Coimbra Charité Medical Neurosciences Berlin, Université Laval Centre de recherche CHUL Québec, and Synaptologies BV.

The European Commission (2012-20) proposes a common approach that includes the following recommendations.

Doctoral programmes should:

- have a critical mass
- include transferable skills training

- respect the principles of the Charter and Code
- challenge disciplinary boundaries
- include research time abroad and in industry

New Marie Curie initiatives of 2012 are proposing increasing the budget for doctoral training, introducing innovative doctoral schools, and building industrial doctoral partnerships.

EU-Asia Higher Education Platform Doctoral Initiative

The EU-Asia Higher Education Platform (EAHEP) was an initiative sponsored by the European Union to promote cooperation in higher education between Asian and European countries. The European University Association (EUA) will be following up the EAHEP project with the project Cooperation on Doctoral Education (CODOC) between Africa, Asia, Latin America and Europe.

A summary of examples of practice can be found at Annex 7.

International

The Australian model of doctoral education

Australia follows the 3+2+3 Bologna model for higher education with two types of postgraduate qualifications - the taught master's and doctorate and the research degrees. In Australia, the Council of Deans and Directors of Graduate Studies (DDoGS) is the body that supports and controls the national development of graduate education (the current President is Helene Marsh at James Cook University). There is a graduate research school or college in every institution that is a branch of the institution administration and looks after the administration all doctoral candidates. It is headed up by a dean of graduate studies who has overall responsibility at an executive level. The flow of reporting and authority is: departmental to faculty to institution, under the leadership of a dean of graduate studies. The research graduate school has responsibility purely for research students and has no taught master's courses or students under its jurisdiction, as there is little or no set discipline-based coursework requirement for doctoral students.

Teaching is not a mandatory part of the Australian doctorate. However, there is an increasing amount of generic skills and research training skills requirements that the research graduate school will deliver and administer. As in the UK, the time to complete a doctorate is three to four years full-time, and electronic profiling on all students from beginning to end is standardised practice and run by the research graduate school. As well as having ultimate academic authority in the institution, the dean of graduate studies has financial control over doctoral programmes. Australia pioneered the development of the professional doctorate which is examined in the same way as a PhD in Australia. The MPhil research degree is also examined in the same way. These research degrees come under the graduate school governance. As the research council landscape is more straightforward than that in the UK (in that there are two major Research Councils), graduate school administration is less complex. However, there are collaborative research schemes across Australia, each of which has around 100 doctoral candidates.

Examples of practice from Australia are summarised in Annex 7.

The North American graduate school model

Whereas generally in the UK postgraduate taught (PGT) provision is linked with undergraduate teaching, the North American graduate school model combines PGT and postgraduate research (PGR). The rationale for this divide in North America is perhaps the generic nature of the American undergraduate degree resulting in taught postgraduate master's courses and a large mandatory, and examined, component of taught courses in the postgraduate research degree. As in the UK, in the larger USA universities some departments admit students for postgraduate master's programmes; others award master's degrees only to students enrolled in other degree programmes. Most departments admit students for doctoral study directly from a bachelor's programme, although some require completion of a master's degree before approval for doctoral work.

As previously stated, the Council of Graduate Schools (CGS)³⁷ represents graduate education in the majority of American and Canadian Universities. It also has global partners outside North America. The CGS seeks 'to improve and advance graduate education in order to ensure the vitality of intellectual discovery'. It claims to do this through 'advocacy, innovative research, and the development and dissemination of best practices'.

Examples of practice from North America can be found in Annex 7.

References

UK Council for Graduate Education (2010) *A Review of Graduate Schools in the UK*, CRAC Ltd

³⁷ www.cgsnet.org

Chapter 5 - supporting the development of doctoral skills and attributes

This chapter considers the development of doctoral skills and attributes with emphasis on postgraduates who teach, public engagement, entrepreneurship, leadership, management, and professional skills and employability: these are areas identified by the International Benchmarking Working Group (IBWG) as of special interest.

5.1 Doctoral skills development - overview

Since the Roberts Review and subsequent recommendations, the UK PhD has undergone a major transformation in the expectations within and external to the HE sector about the skills a doctoral graduate should acquire. This has been an area of considerable development in Scotland and, as would be expected, many examples of effective practice have been identified by the IBWG.

There are differences in approach to the now common but non-mandatory 'additional requirements for a PhD', brought about by developments such as the research councils' Joint Skills Statement (JSS) of 2001 (now being replaced by the Vitae Researcher Development Statement (RDS) the 'Roberts' recommendations, and the *Code of practice for the assurance of academic quality and standards in higher education (Code of practice), Section 1: Postgraduate research programmes*, now being replaced by Chapter B11: Research degrees of the UK Quality Code for Higher Education (the Quality Code). A consensus position by the sector for requirements in this area is set out in the *Code of practice, Section 1* (soon to be *Chapter B11* of the Quality Code), which supports the Researcher Development Statement and references the full Researcher Development Framework (RDF).

It is doubtful whether a fully consistent approach to skills development can be achieved, or is even desirable, however, because of the different needs and entry routes of individual doctoral students and the links between acquiring research and personal skills. Many students develop a range of 'transferable' skills through doing and learning about research, as well as making good use of additional skills training.

The RDS and RDF, supported by all the UK research councils, summarise a UK sector-wide approach to helping doctoral students to develop graduate attributes as well as other skills.

Implementation of the RDS/F is a matter for individual institutions and may need to be championed. Doctoral students expecting to complete in three to four years may be less inclined to take advantage of all the training opportunities on offer if this means less time spent on the research project. Further, the time allowed to complete the PhD (the research and thesis) varies and is generally linked to funding.

It seems appropriate at the beginning of this chapter to consider the Scottish experience alongside that of the UK-wide postgraduate skills agenda as a whole and then later to highlight what has been done in Scotland.³⁸

³⁸ Key documents and reports are SET for Success: the supply of people with science, technology, engineering and mathematics skills' (2002) Sir Gareth Roberts' Review, HM Treasury (http://webarchive.nationalarchives.gov.uk/+/http://www.hm-treasury.gov.uk/ent_res_roberts.htm); The Concordat to Support the Career Development of Researchers (Research Councils UK) (www.vitae.ac.uk/policy-practice/505181/Concordat-to-Support-the-Career-Development-of-Researchers.html); The 'Joint Skills Statement of the UK Research Councils' Training Requirements for Research Students (2001)': www.vitae.ac.uk/cms/files/RCUK-Joint-Skills-Statement-2001.pdf, (now superseded by the Researcher Development Statement and Framework) at: www.vitae.ac.uk/researchers/428241/Researcher-Development-Framework.html.

Major points

- There has been a move away from the traditional master/apprentice model for the PhD (Nerad et al 2008).
- Universities' expansion of PhD numbers may initially have been driven by ambitions for research and Research Assessment Exercise (RAE) scores but the expansion may also have been important in the growth of undergraduate numbers as PhD students are involved in teaching.
- Universities are producing PhDs well beyond the number for the academic posts available (Vitae 2010b).
- Many PhDs are taking up jobs outside academia either through choice or by necessity (Vitae 2010b).

An important turning point in the training of doctoral researchers is linked to the following quote from Sir Gareth Roberts:

The product that the PhD researcher creates is not the thesis - vital though that is to their subject area through the creation of original knowledge - no, the product of their study is the development of themselves.

Vitae

Considerable work has been undertaken by Vitae in the area of researcher development who have an online database for sharing practice in researcher development.³⁹

Vitae was instrumental in the development of The Researcher Development Framework (RDF) (September 2010) and The Researcher Development Statement (RDS) (July 2010), which replaces the Joint Skills Statement (JSS). These are new initiatives which support the implementation of the Concordat and are relevant to all levels of researcher.

Researcher Development Framework

The Researcher Development Framework describes the knowledge, behaviours and attributes of researchers and encourages them to aspire to excellence through achieving higher levels of development. It will be used for planning, promoting and supporting the personal, professional and career development of researchers in higher education. The RDF is the career and personal development tool for researchers and those who support them.

The Researcher Development Statement (RDS) is the strategic statement of researcher development which has all the various research councils and others signed up to it. The Researcher Development Statement sets out the knowledge, behaviours and attributes of effective and highly skilled researchers appropriate for a wide range of careers. The JSS has been 'replaced' by the RDS, although the scope of the RDS is much greater in that it encompasses not just research students but the whole array of research careers.

The RDF Professional Development Planner is available to allow researchers to identify the areas in the framework they want to develop further, create an action plan, and record evidence of their progress.⁴⁰

³⁹ www.vitae.ac.uk/dop

⁴⁰ www.vitae.ac.uk/CMS/files/upload/Vitae-RDF-Professional-Development-Planner.xls

The Concordat is complementary to the RDF and RDS, but slightly narrower in focus as it is more about research staff than all aspects of research careers. More information on the RDF is available online.⁴¹

5.2 The development of doctoral skills and attributes - a Scottish and UK perspective

What appears to differentiate Scotland from the rest of the UK is the development of collaborative models. As already indicated in the previous chapter, to enhance her research base, Scotland has been at the forefront of pooling arrangements across her HEIs. Often this includes the development of subject-specific graduate schools 'research schools' with shared subject-specific training and development. Given that these pooling initiatives exist, perhaps a next logical step would be to 'pool' postgraduate skills and attributes training and development across the Scottish HEIs.

The Scottish Researcher Career Coordination Forum

This Forum was set up in January 2009 and held its inaugural meeting on 21-22 May 2009. Its purpose is 'To bring key players from the Scottish Universities, Scottish government and the Scottish Funding Council together to identify ways in which these bodies could work together in implementing the Concordat Scotland-wide and support the career development of researchers in Scotland'.

The Forum has met four times and hosted a conference (in collaboration with QAA Scotland) in June 2011. In its wide-ranging discussions, the Forum has considered postgraduate skills and attributes linked to the development of a Scottish-wide portal of resources and collaborative models under the heading of 'CHORUS', which stands for 'Collaborative Hub of Opportunities for Researchers in Universities in Scotland'. Development has been slow.

The challenges of such a development include the difference between the research-intensive universities, including the Russell Group, and the other Scottish HEIs; the diverse postgraduate population (full-time PhDs, professional doctorates, part-time and international); and how to build the supporting infrastructure in the current economically competitive HEI environment: in short, the fine line between collaboration and competition between the HEIs. However the Scottish Funding Council (SFC) is keen to encourage an extension of the 'pooling' model to the researcher development agenda in Scotland.

5.3 Doctoral students who teach - UK and Scotland, and internationally

Often, postgraduates and particularly doctoral students are critical members of a team who support undergraduate teaching and learning. They act as lab demonstrators and tutors and contribute to the marking of experimental and tutorial work of undergraduates, particularly in subject areas where there are large class sizes in early years. In many European countries and in America, where postgraduate researchers are salaried, supporting undergraduate labs and tutorials is an integral part of their job description. However, in Scotland and the rest of the UK, teaching is mainly extra to postgraduate research activities and often a lucrative occupation for the postgraduates who get involved, with an average hourly fee of about £20 an hour, resulting in some postgraduates earning around £100 per week during the teaching period.

⁴¹ www.vitae.ac.uk/policy-practice/303831/Resources.html

Hence many PhDs are also 'employed' or paid as Graduate Teaching Associates (GTAs). Provided there is a time allowance in the doctorate and adequate preparation for postgraduates who teach, teaching would seem a reasonable and useful task to get involved with - developing communication, time management and planning skills - which are essential for all postgraduates, whether they choose an academic or non-academic career path. However, there appear to be different experiences of postgraduates who teach, by way of preparation and status, for these important tasks in supporting the undergraduate teaching and learning experience (UKCGE (2010)).

Examples of support for postgraduate teachers, including examples of North American and Australian models, can be found in Annex 8.

5.4 Public engagement, outreach and communication - UK and Scotland

The National Coordinating Centre for Public Engagement (NCCPE) was established in 2008 as part of the £9.2 million Beacons for Public Engagement initiative. It is based at the Watershed Media Centre in central Bristol. It is responsible for running the Beacons for Public Engagement initiative which is a four-year project designed to create a culture change across the higher education sector.

The six beacons are university-based collaborative centres that are working to support, recognise, reward, and build capacity for public engagement. The Centre and the six beacons are funded by the Funding Councils, Research Councils UK and the Wellcome Trust.

Example of practice in public engagement - Edinburgh Beltane

Edinburgh Beltane is the only Scottish Beacon and is one of the larger Beacon partnerships (funded by Research Councils UK, the Wellcome Trust and the Scottish Funding Council) with partners: The University of Edinburgh, Heriot-Watt University, Edinburgh Napier University, University of the Highlands and Islands Millennium Institute, Edinburgh College of Art, Queen Margaret University, Edinburgh Consortium for Rural Research, Edinburgh International Science Festival, Global Science Network, National Museums Scotland, Optos plc, Our Dynamic Earth, Roslin Institute, Royal Botanic Garden Edinburgh, Royal Observatory Edinburgh Visitor Centre, The Herald, The Royal Society of Edinburgh, The Sutton Trust, Vitae.

PGRs can work towards a Beltane Certificate in Public Engagement.

Vitae has published a set of best practice guides for PGRs, one of which is 'The engaging researcher: inspiring people to engage with your research' (July 2010). It states: 'the guide offers practical tips on how public engagement can benefit you, your research and the public with whom you engage.'

5.5 Entrepreneurship, leadership, management and professional skills

UK and Scotland

There are many examples of initiatives within higher education in Scotland and the UK designed to improve the entrepreneurship and employability of PGRs. Two examples of Scottish initiatives are summarised at Annex 9.

International developments

The Strategic Leaders Global Summit on Graduate Education - Career Outcomes for Graduate Students: Tracking and Building Pathways took place in Hong Kong in September 2011. As a result of this event, 35 higher education leaders from 16 countries agreed to a statement of principles to strengthen and create pathways from graduate school to careers.⁴²

This outcome supports the notion that the issues being raised and addressed in Scotland regarding PGR skills and attributes, employability and careers are common on a global stage; countries must collaborate in the development of PGRs and doctoral education must be strengthened by transferable skills relevant to the workplace and the growing knowledge economy.

In discussion with the European Universities' Association Council for Doctoral Education (EUA-CDE), it was concluded that the UK, particularly under the auspices of Vitae, is really at the forefront of skills development. However, universities in the United States such as Stanford and MIT in science and technology subjects often provide an 'Affiliates Program' where there is a better flow of academic know-how and information from academia to industry and vice versa. This influences the attitude of the research community and provides opportunities for doctoral candidates to improve their networking with the employment community outside academia and their 'employability skills' as a whole.⁴³

This is an interesting idea that could be developed within each of the Scottish Research Pools.

5.6 Employability of doctoral graduates - UK and Scotland

The report of the Leitch Review (December 2006) of world class skills highlights the importance of postgraduates in driving innovation, entrepreneurship, management leadership, and research and development. However, a CIHE Report (March 2010) for the Department of Business Innovation and Skills, based on the outcome of surveys and interviews with senior business executives and human resource managers, states:

The past 10 years or so has seen a spectacular growth in postgraduate education in UK Higher Education Institutions (HEIs), with a 36 per cent jump in the number of students studying for higher degrees. But, how much of this is driven by employer demand? And how much do businesses value and reward these hard-won and sometimes expensively-acquired qualifications?

The Council for Industry and Higher Education (CIHE) Report agrees that there is a high demand for, and strong satisfaction with higher degrees, but highlights the need for HEIs and businesses to work together to ensure postgraduates have the skills and knowledge that employers need - particularly leadership skills and work experience. The authors of the report state that while businesses value postgraduates with their technical skills for high level research and development, the higher education sector needs to engage better with employers to ensure that PGRs are 'work wise' and engaged with 'real world' challenges.

⁴² Details of the principles can be found at: www.cgsnet.org/sites/default/files/Printer_Friendly_Version_9-28-2011.pdf.

⁴³ www.stanford.edu/group/ICO/industry/industryAffiliate.html

The report implies that quality, relevance, branding and marketing of current PGR courses and training is lacking and that HEIs are advised to collaborate more to increase professionalism.

Throughout the report, employers raise issues in their recruitment for master's and doctorates (importantly, the concerns are greater for doctorate graduates than for master's) that include:

- Lack of commercial awareness
- Limited work experience
- Inability to market skills
- Narrow focus/over-specialised
- Unrealistic expectations
- Difficulty in adapting to non-academic environment

Reading the CIHE report, there appears to be a cultural mismatch between HEIs and the business environment. In an attempt to address this, the Scottish Funding Council has introduced its SPIRIT programme.

Example of practice - The SPIRIT Programme⁴⁴

The Scottish Funding Council SPIRIT programme has been developed to encourage the flow of researchers between business and academia in a bid to increase knowledge exchange and to break down cultural perceptions. Many HEIs who were successful recipients of these awards include joint industry/academia doctorate programmes and two-way secondments of later stage researchers in their applications.

Vitae has conducted some very interesting and relevant studies in the destinations and impact of doctoral graduates.⁴⁵

- *What do researchers do? Career profiles of doctoral entrepreneurs* (2010) is a collection of 30 career stories from doctoral researchers who have gone on to become entrepreneurs.
- *What do researchers do? Career profiles of doctoral graduates* (2009) is a collection of 40 career profiles. These career stories provide insights into the paths that doctoral graduates take beyond their first destination.
- *What do researchers do? Career paths of doctoral graduates* (2011) illustrates that doctoral research training is a good foundation for a wide variety of occupations and demonstrates the flexibility of researchers who take advantage of a diversity of employment opportunities.
- *What do researchers do? First destinations of doctoral graduates by subject* (2009) demonstrates that doctoral graduates continue to be highly employable across the economy in a wide range of occupations.
- *What do researchers do? Doctoral graduate destinations and impact three years on* (2010) provides, for the first time, comprehensive evidence of the value of doctoral study to the researchers, their employers and society at large.

⁴⁴ www.sfc.ac.uk/knowledge_exchange/SPIRITstrategiccompetition200912.aspx

⁴⁵ Full reports can be downloaded at: www.vitae.ac.uk/policy-practice/107611/What-do-researchers-do-.html.

An analysis of the employment destinations in this document confirms that just over 40 per cent of doctoral graduates are employed within the HE sector indicating that around 60 per cent of UK HEI doctoral graduates will be employed outside the sector following graduation. Further, the number of doctoral graduates working in research roles of any type (HE and non-HE) is 41 per cent six months after graduation and reduces to 32 per cent three years later.

It appears the majority of employment opportunities for doctoral graduates are outside higher education and outside a research environment. Hence, there is a necessity to fully engage employers both in the development of postgraduate skills programmes and to provide opportunities for internships to break down cultural barriers between HEIs and the business environment. Table 1 below summarises recent doctoral destination statistics produced by Vitae.

Table 1: Destination Statistics for PGRs (Vitae 2010)

	6 months after graduation	3.5 years after graduation
% of doctoral graduates working in HE research roles	26	19
% of doctoral graduates working in non-HE research roles	15	13
% of doctoral graduates working in HE teaching and learning roles	17	22
% of doctoral graduates working in teaching and learning roles outside HE	6	6
% of doctoral graduates working in other common doctoral occupations	22	27
% of doctoral graduates working in other occupations	15	14

5.7 The development of postgraduate skills and attributes internationally

In many European countries, doctoral students are employees of the university. In America and Australia, there are teaching internships for postgraduates who are interested in teaching to help them develop their teaching skills. Annex 8 provides examples of doctoral teaching schemes in North America and Australia.

5.8 International models of public engagement, outreach and communication

The following international examples of practice provide a range of models for supporting doctoral students in developing a range of skills that promote their abilities to be successful in these areas.

Communication skills development

Example of practice - The Three Minute Thesis Competition - an academic elevator pitch from Australia

The University of New South Wales, Sydney, Canberra, Australia runs the 3 Minute Thesis (3MT) competition which is an academic competition originally developed by the University of Queensland for PhD and Research Master's candidates. With just three minutes to give a compelling presentation on their thesis topic and its significance, the 3MT competition forces research candidates to consolidate their ideas and crystallise their research discoveries.

Writing skills development

Example of practice - Writing workshop for the Norwegian Research School in Climate Dynamics

The Research School in Climate Dynamics, ResClim, runs an annual writing workshop for PhD candidates. This is based on a very successful annual programme that has been running for four years in Hamburg and two years at the University of Miami.

Before the workshop begins, students are asked to submit a scientific paper, and all papers are disseminated to each student. Each paper is examined one by one with student participation. Experience shows that the central writing problem for young scientists involves matters of structure and a clear and concise statement of ideas. While part of the objective is to improve the submitted paper, it is equally important to offer the students a set of composition principles that can be applied to every paper. Each workshop is limited to 15 people and runs over five days. Each day, the participants consider and review three papers. Academic staff are welcome to join the workshops and are encouraged to contribute to the discussions.

Example of practice - The University of Michigan Rackham Graduate School and Sweetland Center for Writing - Workshops on Writing

The Rackham Graduate School works with faculty, students and staff across the University of Michigan to promote excellence in graduate education for over 7,000 students in 108 PhD, 83 master's, and 33 certificate programs. The Sweetland Center for Writing, a comprehensive writing centre, exists to support student writing at all levels and in all forms and modes.

In collaboration with Rackham, the Sweetland Center for Writing offers student lead, faculty-mentored, small writing groups for graduate students. The aim of this programme is to provide structured writing support in a facilitated peer-based setting to help graduate students from various disciplines revise their writing and meet their writing goals for long-term projects. To participate, group members must be working on a piece of writing continuously over the course of the semester (for example, a final seminar paper, a master's thesis, a dissertation prospectus, a dissertation chapter or set of chapters, and so on). Each group meets eight times per semester, and works on each group member's writing on a rotating basis. The writing is submitted in advance to all group members on a schedule agreed upon by the group. The regular weekly meeting times are also determined by the group.⁴⁶

⁴⁶ www.lsa.umich.edu/sweetland/forstudents/dissertationwritinginstitute

The collaboration also runs the Dissertation Writing Institute which is for graduate students whose research is complete or nearly complete, and who have conceptualised the principal elements of the dissertation or are already writing their dissertation.

Participants attend the Institute for at least six hours each day during the eight weeks of the spring term. Sweetland provides a computer, if needed, and work space where students can leave books and other materials. Students participate in group discussions, where they share their writing and receive feedback. In addition, participants receive individual writing consultations with a Sweetland faculty member. Participants may not hold another position during the eight-week period of the Institute and must work full-time on their dissertations, receiving a stipend of \$3,000.

References

Council for Industry and Higher Education (2010) *Talent Fishing: What Businesses want from Postgraduates*, The Council for Industry and Higher Education: London

Leitch (2006) *Prosperity for all in a global economy - world class skills*, HM Treasury, UK Government: London

Quality Assurance Agency (2004) *Code of practice for the assurance of academic quality and standards in higher education: Section 1, Postgraduate research programmes*, available at: www.qaa.ac.uk/Publications/InformationAndGuidance/Pages/Code-of-practice-section-1.aspx (last accessed 15 May 2012)

Research Councils UK (2001) *The Joint Skills Statement of the UK Research Councils Training Requirements for Research Students*, available at: www.vitae.ac.uk/cms/files/RCUK-Joint-Skills-Statement-2001.pdf (last accessed 15 May 2012)

Research Councils UK (2002) *The Concordat to Support the Career Development of Researchers* available at: www.vitae.ac.uk/policy-practice/505181/Concordat-to-Support-the-Career-Development-of-Researchers.html (last accessed 15 May 2012)

Roberts, G (2002) *SET for success. The supply of people with science, technology, engineering and maths skills*, HM Treasury, UK Government: London

United Kingdom Council for Graduate Education (2010) *Preparing to Teach in Higher Education*, United Kingdom Council for Graduate Education: London

Vitae (2009) *What do researchers do? Career profiles of doctoral graduates*, CRAC Ltd

Vitae (2009) *What do researchers do? First destinations of doctoral graduates by subject*, CRAC Ltd

Vitae (2010) *Researcher Development Statement*, CRAC Ltd

Vitae (2010) *Researcher Development Framework*, CRAC Ltd

Vitae (2010) *The engaging researcher: inspiring people to engage with your research*, CRAC Ltd

Vitae (2010) *What do researchers do? Career profiles of doctoral entrepreneurs*, CRAC Ltd

Vitae (2010) *What do researchers do? Doctoral graduate destinations and impact three years on*, CRAC Ltd

Vitae (2011) *What do researchers do? Career paths of doctoral graduates*, CRAC Ltd

Chapter 6 - Conclusions and Recommendations

Chapter 1 summarises the context for and the purposes and scope of this report, which are, broadly:

- to identify effective practice in doctoral education
- to learn from international models, as well as those closer to home
- to disseminate information about different models for managing and supporting doctoral education with the aim of enhancing provision in Scotland.

The International Benchmarking Working Group (IBWG) has been able to access a wealth of information about doctoral education, which is presented in the report. As the report is being made available online, it is hoped that a wider and perhaps international audience will find its contents useful as a reference point for different elements of doctoral education.

Rather than being overly prescriptive in the ways in which Scottish institutions use the report contents, the IBWG's intention is that individuals and institutions will adopt and adapt any practices that are of particular relevance to them and their doctoral students, especially when undertaking restructuring or making changes to provision. The IBWG would nevertheless wish to highlight the following points as being significant outcomes of the report, which may be worthy of further discussion by institutions and sector-wide bodies in Scotland. Actions the IBWG strongly encourages or recommends are in bold type.

Over the last decade, there has been a steady increase in postgraduate researcher numbers, in Scotland and elsewhere. A similar growth pattern is seen in all 27 OECD countries (chapter 1, Figures 1 and 2). The growth is greater for women, and there has been an increase in international PGRs. While this growth in numbers of international PGR students is welcomed, significant expansion in doctoral student numbers may prove challenging.

Maintaining buoyant recruitment of PGR students will require a strategic approach, including consideration of diverse modes of study and sponsorship. For example, to help address the needs of part-time students and help integrate them into the research community, the IBWG has identified the collaborative Scottish Part-time Researchers Conference as a useful model (chapter 2). Also in this context, Scottish HEIs should be aware of the emerging market of part-time and online provision of professional doctorates in a range of areas. Increasing the recruitment of international postgraduate students is also seen as a means to strengthen an institution's international profile and research base. However, there is much global competition for high quality doctoral students (Kemp et al, 2008), and institutions will also need a strategic approach to this element of recruitment. (Chapter 1: 1.2, 1.3; chapter 2: 2.3).

Broadening the Scottish doctoral experience by internationalisation is a positive developmental experience for the student and expands the research base of the university and Scotland. The main challenges to internationalisation at present are: the lack of funding, the need to set up partnerships and find ways of supporting them, and the complexity of setting up individual university processes and agreements. (Chapter 1: 1.4.2).

Scottish HEIs could benefit from greater involvement with international organisations that foster collaboration at doctoral level. **To encourage Scottish university participation in joint international PhD programmes, Scottish HEIs collaborate to form a central resource providing funding, advice and draft agreements, drawing on experience elsewhere.** This would facilitate collaboration and help to make education partnership processes as straightforward as possible for staff and students (chapter 1: 1.4.3).

It is important that institutions are in touch with doctoral student opinion, which can best be used constructively to improve provision and support. **It is recommended that all Scottish institutions take part in the Postgraduate Research Experience Survey (PRES) or conduct a similar satisfaction survey of their PGR population and that the results are disaggregated to provide quantitative evidence of, specifically, the experience of PGR students in Scotland.** This information could be used to benchmark 'the research degree student experience' within Scotland and to provide an enhancement tool in international comparisons (chapter 2: 2.2).

To assist international doctoral students in their integration, **it is recommended that all Scottish institutions provide accessible, targeted general support (academic and non-academic) for international PGRs and their families. Support should include pre-arrival and pre-registration information, details about language learning and other induction opportunities including research communication.** This could be done through a collaborative model, drawing on best practice in the rest of the UK and overseas (chapter 2: 2.4 and Annex 4).

There is a **need to be more proactive and structured about how academic standards and the quality of doctoral programmes are reviewed, internally and externally.** A consensus by the sector for requirements in this area would be welcome. (Chapter 3: 3.3).

Given the expansion in doctoral education over the last decade, there is clearly much diversity and debate across disciplines about titles, content and purpose of the doctorate. However, in the interests of doctoral candidates, graduates and employers, **it would seem timely to have a review of qualification titles at doctoral level, using the doctoral qualification descriptor and the Scottish Credit and Qualifications Framework (Chapter 3).** In the current system, and with the increase in professional doctorates, different titles can lead to confusion for doctoral candidates, graduates and employers. It would appear that there is scope for rationalisation across the sector. (Chapter 3)

Effective supervision is key to a high quality environment in which doctoral students flourish. It is clear that no one supervision model fits all students or all subjects. However, **it would be useful for Scottish HEIs to consider a coordinated approach to initial and supplementary supervisor training that all supervisors are expected to engage in,** using QAA reference points to set out an appropriate framework. (Chapter 1: 1.4.1 and Annex 3; Chapter 3: 3.2, 3.5).

An excellent research environment is essential for high quality doctoral education. Attributes of such an environment are described in detail in *Chapter B11: Research degrees* of the UK Quality Code for Higher Education (the Quality Code). With 20 closely connected HEIs and a tradition of academic collaboration, Scotland is a well connected hub of world-leading research. Research pools add to the richness of postgraduate education and training and the critical mass agenda, while also introducing a further layer of complexity.

There is general international agreement that doctoral programmes should:

- have a critical mass
- include subject-specific training in research methods
- include transferable skills training
- respect the principles of UK-wide and non-UK European frameworks for effective practice in doctoral education
- challenge disciplinary boundaries
- where relevant, include research time abroad and in industry

Different models of the 'DTC' concept (chapter 4) have been adopted by most of the UK Research Councils. Summaries of UK and international models can be found in Annexes 6 and 7.

National agencies working together is a strength of Scottish provision. **The IBWG suggests that Scottish institutions may benefit from a review of existing graduate schools and doctoral training centres, so as to optimise their effectiveness and reduce any duplication of effort** (chapter 4: 4.1-4.3 and Annex 7).

The involvement of postgraduate, mainly doctoral, research students (PGRs) in teaching seems to be universal in Scotland. Indeed, it seems that they make a significant contribution to undergraduate education. The result of this study of Scottish universities revealed that there does not seem to be a universal pattern to preparing postgraduates for their teaching duties. In some universities they cannot begin teaching until they have been through a training period of some kind (chapter 5: 5.3 and Annex 8).

The proportion of PhD researchers in Scotland from outside the UK HEI system is large - around 47 per cent in HESA data. The change in culture, particularly teaching culture, and the necessity to have good English, raises issues of the preparation of these students for teaching. One discussion point that came up is whether or not teacher training should be compulsory before tutorials and demonstrating begin.

It is recommended that all Scottish institutions awarding research degrees have in place a teaching preparation programme drawing on best practice in the rest of the UK and overseas which PGRs begin, and if possible complete, before they begin teaching (chapter 5: 5.3).

The Roberts agenda has emphasised the need for PGRs to engage in skills development to prepare them for their careers. The available evidence suggests that this training is not widespread enough and is not meeting the needs of all students or employers, all of whom have diverse requirements. In view of the wide diversity of employment taken up by PGRs, there is a necessity to fully engage employers in the development of postgraduate skills programmes. **To assist doctoral graduates in the transition to the next step in their careers, it is recommended that Scottish institutions develop opportunities for postgraduate internships and affiliates programmes, drawing on best practice in the rest of the UK and internationally** (chapter 5: 5.1, 5.2, 5.5).

Summary of recommendations

- 1 Maintaining buoyant recruitment of PGR students will require a strategic approach, including consideration of diverse modes of study and sponsorship (chapter 1: 1.2, 1.3; chapter 2: 2.3).
- 2 To encourage Scottish university participation in joint international PhD programmes, Scottish HEIs collaborate to form a central resource providing funding, advice and draft agreements, drawing on experience elsewhere (chapter 1: 1.4.3).
- 3 All Scottish institutions take part in PRES or conduct a similar satisfaction survey of their PGR population and the results are aggregated to provide quantitative evidence (chapter 2: 2.2).
- 4 All Scottish institutions provide accessible, targeted general support (academic and non-academic) for international PGRs and their families. Support should include pre-arrival and pre-registration information, details about language learning, and other induction opportunities including research communication (chapter 2: 2.4 and Annex 4).
- 5 There is a need to be more proactive and structured about how academic standards and the quality of doctoral programmes are reviewed, internally and externally (chapter 3: 3.3).
- 6 It is timely to have a review of qualification titles at doctoral level, using the doctoral qualifications descriptor and Scottish Credit and Qualifications Framework (chapter 3).
- 7 It would be useful for Scottish HEIs to consider a coordinated approach to initial and supplementary supervisor training that all supervisors are expected to engage in (chapter 1: 1.4.1 and Annex 3; chapter 3: 3.2, 3.5).
- 8 Scottish institutions may benefit from a review of existing graduate schools and doctoral training centres, so as to optimise their effectiveness and reduce any duplication of effort (chapter 4: 4.1-4.3 and Annex 7).
- 9 All Scottish institutions awarding research degrees have in place a teaching preparation programme drawing on best practice in the rest of the UK and overseas which PGRs begin, and if possible complete, before they begin teaching (chapter 5: 5.3).
- 10 To assist doctoral graduates in the transition to the next step in their careers, Scottish institutions develop opportunities for postgraduate internships and affiliates programmes, drawing on best practice in the rest of the UK and internationally (chapter 5: 5.1, 5.2, 5.5).

Annex 1

International Benchmarking Working Group - Membership

Institution	Full name
Members	
University of Aberdeen	Professor Dominic Houlihan (Chair)
University of Aberdeen	Professor William G. Naphy
University of Abertay Dundee	Professor David Heeley
University of Dundee	Dr Lesley McLellan
University of Edinburgh	Professor Mary Bownes
Edinburgh Napier University	Professor Alison McCleery
University of Glasgow	Dr Ralf St Clair
	Dr Alison Phipps
Glasgow Caledonian University	Professor Sue Scott
Glasgow School of Art	Dr Naren Barfield
Heriot-Watt University	Professor Alan Miller
Queen Margaret University	Professor Alan Gilloran
Robert Gordon University	Professor Linda Lawton
Scottish Agricultural College	Dr Mark Hocart
University of Stirling	Professor Ian Simpson
University of Strathclyde	Dr Richard Black
	Dr Alison Mitchell
University of the West of Scotland	Professor Hassan T Hassan
NUS Scotland	Mr Mike Williamson
Observers	
NUS Scotland	Ms Louise McLaren
Heriot-Watt University	Ms Denise McCaig
Scottish Funding Council	Ms Sandhya Kapitan
Vitae Dr Jon Turner	
Universities Scotland	Dr Charles Marriot
Higher Education Academy	Professor Sue Law
Vitae Ms Amy Cartwright	
Officers (all QAA Scotland)	Dr David Bottomley
	Dr Frances Morton
	Ms Sarah Logie
Consultant	Mrs Avril Manners
Editor	Ms Gill Clark

Annex 2

IBWG - Programme of work

An initial scoping workshop was held in September 2009. The IBWG convened six times during the course of the benchmarking exercise and with QAA Scotland collaborated with SFC, Vitae and HEA to run a series of events to identify and explore the issues affecting the postgraduate researcher (PGR) experience in Scottish HEIs. Leadership of the events was shared among the organisations.

Events

- 11 September 2009: Scoping Workshop, held by the Scottish Funding Council at the Apex Hotel, Edinburgh
- 30 April 2010: International benchmarking: postgraduate research degree student experience, led by QAA Scotland, Mercure Point Conference Centre, Edinburgh
- 7 October 2010: Workshop on 'New' Doctorates - Practice-based, Professional and Industrial, led by QAA Scotland, at the University of Edinburgh
- 4 November 2010: Graduate Schools and Researcher Experiences, led by Vitae at the University of Strathclyde, Glasgow
- 21 January 2011: Researcher Skills and Career Development: Issues for Scottish higher education institutions
University of Edinburgh, Informatics Building
QAA Scotland in collaboration with UKCGE
- 18 March 2011: The 21st Century Doctorate - sharing European developments
Scotland House, Brussels
QAA Scotland in collaboration with Scottish Government
- 30 March 2011: Postgraduates who Teach: developing the next generation HEA
- 9-10 June 2011: Joint conference with the Scottish Researcher Career Coordination Forum.

Between autumn 2011 and January 2012 the report was written. In February 2012 an editorial meeting of the International Benchmarking Working Group (IBWG) took place with an external editor employed by QAA Scotland, where the content and format were finally approved, for initial launch of the report at the Enhancement Themes conference on 7 and 8 March 2012.

Visits and conference attendance

Members of the group travelled to Brussels in August 2010 to engage with the European Universities Association - Council for Doctorate Education (EUA-CDE). Avril Manners attended the second International Conference on Professional Doctorates in April 2011. Avril Manners and Dominic Houlihan attended the annual EUA-CDE conference in June 2011 and Avril attended the HEA PRES Workshop in June 2011. Avril presented a paper on the work at the International Conference of Education, Research and Innovation in November 2010 and gave a presentation at the SHEEC Annual Enhancement Conference in March 2011.

Annex 3

Extract from QAA Doctoral Degrees Characteristics guide (2011)

3.1 Summary of UK doctoral awards and their main characteristics

The following doctoral degrees have many common characteristics and are all part of a group of qualifications with equivalent academic standards and status, as is made clear in the QAA qualifications frameworks and the *Code of practice, Section 1: Postgraduate research programmes*. The purpose of this section is to show both the similarities that exist among doctoral awards and their defining characteristics as individual qualifications, so that it is possible to distinguish between them and the different purposes they fulfil. The general descriptions below are not comprehensive but are intended to give a flavour of what makes each award distinctive.

Doctor of Philosophy (PhD or DPhil, used interchangeably)

The first Doctor of Philosophy (DPhil) in the UK was awarded by the University of Oxford in 1917, and the title has been retained since for degrees awarded on the basis of registration on a formal programme of study offered by an academic institution and an output that constitutes original research as defined by the academic community into which the candidate wishes to be admitted.

Main characteristics

- Still the most common form of doctorate in the UK, PhD or DPhil programmes are based largely on a supervised research project over three to four years (full-time; part-time candidates normally take up to twice as long), during which the candidate is registered at a higher education institution. All doctoral candidates are required to make an original contribution to knowledge by conducting an independent research project; the form this takes depends on the candidate's academic discipline and degree.
- More recently, there has been a greater emphasis on personal and professional development in PhD programmes in the UK, especially during the period of ring-fenced 'Roberts' funding at the beginning of the twenty-first century, managed by Research Councils UK, which has led to increasingly structured programmes that include both research and transferable skills training. Acquisition of these skills, together with evaluation of the candidate's discipline-specific research skills, is generally monitored or assessed through annual progress reviews. Whether or not the structured elements are formally assessed, examination of the research degree itself focuses on the quality of the candidate's thesis or equivalent and his/her defence of it at the viva voce ('viva').
- Practical work, such as in the creative and performing arts, may well form part of a candidate's PhD output, or the output from professional and practice-based doctorates. Artefacts and outputs of a practical nature, sometimes involving multimedia, are related to the candidate's discipline rather than to a form of degree programme.

Assessment

In the final assessment, candidates are assessed on their thesis, portfolio, artefact or composition (the latter two normally and the portfolio sometimes are accompanied by a critical commentary on the work), and by an oral examination, the viva. A minimum of two examiners are usually present, one internal and a minimum of one external. Some universities allow the supervisor to attend the viva, with the candidate's agreement, an some universities involve an independent chair to assure fairness and consistency of practice, as well as adherence to assessment regulations.

PhD by publication

Many institutions award the PhD/DPhil 'by publication' or 'by published work' which may then be reflected in the title (PhD by Publication, or by Published Work). Institutions have different eligibility requirements for this degree, which is awarded infrequently.

Main characteristics

- The PhD by publication shares most of the characteristics of the PhD/DPhil above and is normally awarded on the basis of a series of peer-reviewed academic papers, books, citations or other materials that have been published, accepted for publication, exhibited or performed, usually accompanied by a substantial commentary linking the published work and outlining its coherence and significance, together with an oral examination at which the candidate defends his/her research.
- A PhD by concurrent publication is now permitted by some institutions, particularly in science and engineering subjects, whereby a candidate can present a portfolio of interconnected, published research papers contextualised by a coherent narrative, demonstrating overall an original contribution to knowledge. Such publications may include papers, chapters, monographs, books, scholarly editions of a text, technical reports, creative work in relevant areas, or other artefacts.
- In the case of a PhD by publication or published work, the candidate may not be required to register formally for the qualification or to have followed a formal programme of study towards the degree; in other cases a shorter than normal period of registration is permitted for such candidates, who may already be graduates or academic staff members of the institution, or of a partner institution.

Assessment

In the PhD by publication the candidate is normally examined on these materials and the commentary, sometimes supported by a CV. The final assessment takes the same form as outlined above for other PhDs, namely assessment of the thesis and/or portfolio and an oral examination. If the candidate is a staff member of the university, then it is usual to appoint two external examiners for the final assessment in addition to an internal examiner.

Integrated PhD (PhD)

Main characteristics

- Some universities have introduced the 'integrated' PhD in a range of subjects. These programmes are structured in nature, normally with a choice of taught modules and a range of research topic options within the field of study, and include formal lectures, research seminars and workshops at master's level during the first year or two years.
- The supervised research project may begin at the point of registration and be undertaken in parallel with structured elements, or may depend on successful completion of taught elements and be undertaken in years three and four.
- Integrated PhDs normally offer exit awards at master's level based on successful completion of taught modules. If in a scientific discipline, integrated PhDs may offer candidates the opportunity to convert to a specialist research area from other scientific disciplines.
- Research training provided through research council funded centres for doctoral training (see 1.4) is similar to the integrated PhD model.

Assessment

Although some integrated PhD candidates may have to pass taught elements, the overall assessment for the award is submission of a satisfactory thesis, portfolio or similar output and successfully passing an oral examination with independent examiners, as for the PhD and PhD by publication.

Professional and practice-based (or practitioner) doctorates

As part of the diversification of UK doctorates, qualifications have evolved, often in response to the needs of the professions, and/or the career progression of professionals working in different fields. Often, professional and practice-based doctorates are the choice of doctoral degree for mid-career professionals; in a few cases they are required for entry to a profession, namely as a licence to practise. Even if not studied for career reasons, such degrees can provide an opportunity for individuals to situate professional knowledge developed over time in a theoretical academic framework. As a result, professional and practice-based doctorates have different structures and attract candidates at distinct stages of their lives and careers.

Doctorates in which the candidate is involved in professional learning may fall in either the professional or practice-based category, depending on degree content and context, and on the candidate's circumstances. In this guide, we have chosen to combine information about professional and practice-based doctorates in one section to avoid repetition and because, at the macro level of doctoral characteristics that this guide is concerned with, it is difficult to address detailed differences. This approach may not be in line with some of the thinking about these degrees, but we have taken care to make clear the differences between the two, where they are significant.

Individual institutions make the final decision about whether a qualification should be described as a professional or practice-based doctorate, using defining criteria that may differ somewhat.

Titles of professional and practice-based doctorates normally reflect the subject or field of study of the candidate and thus there is considerable variation in nomenclature. However, institutions normally use the convention of 'Doctor of...', for example, Doctor of Education (EdD) - the first EdD programme was established at the University of Toronto, Canada, in 1894 (Scott et al, 2004) - or Doctor of Social Science. This helps to achieve a degree of consistency, with institutions making the final decisions about the titles of their academic awards in consultation with any relevant professional, regulatory or statutory body (PSRB). Professional and practice-based doctorates normally include structured elements such as lectures, seminars, and workshops, with an emphasis on the candidate acquiring skills relevant to their professional practice, in addition to producing original research. Some programmes may also provide other forms of learning support such as e-learning, tutorials, peer learning and assessment, and so on.

Main characteristics

- Professional and practice-based doctorates are based on a supervised research project and usually contain significant lecture and seminar elements. In some programmes, these elements are assessed and either a pass/fail or a mark or grade is given; such assessments may act as incremental hurdles for the candidate as part of his/her progress towards the independent research project. UK professional doctorates are designed to meet the needs of the various professions in which they are rooted, including: business, creative arts, education, engineering, law, nursing and psychology.
- Research projects in these degrees are normally located within the candidate's profession. In practice-based or practitioner doctorates the candidate's output involves practice-related materials. For example, in the performing arts, the output involves a written commentary (which may be shorter than the traditional PhD thesis, and includes both reflection and context), and one or more other artefacts, such as a novel (for creative writing), a portfolio of work (for art and design), or one or more performance pieces (for theatre studies, dance, or music). In clinical practice-based doctorates such as the DCLinPsy or the MD, the research is likely to draw on clinical work involving clinical trials or other work with patients in the practical/clinical setting; the clinically based and academic research are then combined in the candidate's thesis or portfolio.
- Professional doctorates are normally rooted in an academic discipline as well as in a profession (education, engineering, law and so on). Candidates whose research arises out of practice alone, who are not working in an academically related professional field and who spend most of their time learning in their work environment rather than in an institution, would be more likely to complete a practice-based doctorate. In both practice-based and professional doctorate settings, the candidate's research may result directly in organisational or policy-related change. Some practice-based doctorates have a general title to reflect their distinctiveness.

Assessment

As for the PhD/DPhil, professional and practice-based doctorates are assessed through submission of a thesis or portfolio and, in the majority of cases, an individual oral examination, or viva. The institution's definition of whether the award is a professional or

practice-based doctorate will have a bearing on the assessment criteria for the degree. The thesis may be of a shorter length than for the PhD to reflect the assessed work completed by candidates during the programme. In the assessment of professional and/or practice-based doctorates, examiners' criteria may include the extent to which the candidate understands current techniques in the discipline, for example through demonstrating engagement with and use of research methods and how they inform professional practice.

Annex 4

Supporting international and part-time students

Note: some of these examples are also relevant to part-time students, whether or not they are international.

Broad-ranging support for international students studying in Scotland

Example of practice - Compass

The Institute for Academic Development (IAD), the University of Edinburgh⁴⁷

The International Compass Programme is a series of training events and cultural activities specifically aimed at first-year international PhD and taught master's students.

The courses cover: settling into Scotland and the University, Managing your Supervisor; Writing in English; Careers, and Visa issues.

Courses are supplemented with cultural activities including a Burns Night, trip to Glencoe and a visit to the Parliament.

The IAD and the International Office at the University of Edinburgh were aware that support for international students was not covered by Roberts Funding, that international students had very specific needs, and that this was not currently being supported in the University.

The Compass programme aims to provide:

The opportunity for international PGR students to socialise, network and learn about Scotland; the opportunity for international PGR students and their families to visit other parts of Scotland; transferable skills training for participating international PGR students; professional and career information and advice for participating international PGR students.

Funding was the primary concern as usual paths (for example Roberts allocation) were not available to IAD. This project has been secured within the IAD for 2011.

Expanding the programme to deal with demand is also an issue, and ideally IAD would like to run courses for second and third years in addition to the current programme of events.

Supporting international and part-time PhD students through a student association (1)

Example of practice - The Edinburgh University Student Association (EUSA) Postgraduate Festival⁴⁸

The EUSA Postgraduate Festival was held for the first time in 2010-11 to bring together a number of skills and personal development opportunities, career-focused and funding events, and a Postgraduate Conference, as well as postgraduate social events aimed at improving the postgraduate experience at Edinburgh, facilitating the development of the Edinburgh postgraduate community and bolstering awareness and uptake of opportunities available to postgraduates from

⁴⁷ www.ed.ac.uk/schools-departments/institute-academic-development/postgraduate/doctoral/courses/compass/schedule

⁴⁸ www.eusa.ed.ac.uk/postgraduatefestival

across the University. The Festival was organised by the Edinburgh University Students' Association in association with the Careers Service, Institute for Academic Development, Information Services, and the Scholarship Office of the University of Edinburgh. While targeted to all the PGR and taught master's community at the University of Edinburgh, it has particular relevance to those areas which rely on the formation of a PhD community within the institution, such as supporting international and part-time students.

Students' Unions have traditionally struggled with engaging postgraduates and demonstrating the relevance of being active in their Union to postgraduates. By highlighting opportunities from across the University and facilitating more social and skills events relevant to postgraduates, EUSA hoped to have an impact on postgraduate recognition of the role and benefits of EUSA membership and to have a positive impact on the postgraduate experience at Edinburgh, while facilitating access to new opportunities such as interdisciplinary knowledge exchange through the postgraduate conference.

Such events benefit from established brand recognition and identity within the intended postgraduate audience, and this was always going to be a challenge within the first year. However, it is likely that in future years, this will increasingly become less of a challenge as the EUSA Postgraduate Festival is able to build its reputation and establish itself as a fixture within the Academic Calendar.

Supporting international and part-time PhD students through a student association (2)

Example of practice - The PhD Students' Association at Queen Margaret University (QMU), Edinburgh

This example has particular relevance to those areas which rely on the formation of a PhD community within the institution, such as supporting international and part-time students. As a small institution based on one campus QMU has an almost unique opportunity to forge links between PhD students. For the past four years QMU has been operating a student-led PhD Association which aims to take on a number of roles within the PhD community; including pastoral support, promotion and development of essential postgraduate skills and training, and the all important social events which propagate a sense of community and therefore a supportive environment in which collaborative working can flourish. The PhD Association now plays an integral role in the induction of the new PhD students each year and also organises an annual conference for PhD students which is open to staff and students from QMU and other institutions. Both of these events have led to the PhD Association being allocated a budget and therefore a sense of fiscal autonomy from the University.

All PhD and Professional Doctorate students are automatically members of the Association and a number of 'Co-chairs' are identified from the membership annually. Normally the Co-chairs are first-year students who have the time and drive to carry out the role, and QMU has found that this also helps to gel the new intake of students as a cohort by giving them a sense of inclusion in the PhD community.

The idea behind the PhD association was to give the PhD students a sense of ownership of both their own learning and their social network. The PhD Association organises the annual QMU PhD Student Conference and a monthly lunch for all PhD students called Box Lunch Tuesdays.

The PhD Association provides PhD students with a support network made up of other fellow PhD students. This is extremely important in that undertaking a PhD can often leave students feeling stressed or overworked, and having a network of other students to confide in or discuss pertinent issues can be vital to ensuring successful completion of the PhD. The Co-chairs also run confidential one to one 'surgeries' every three months, where students can discuss any issues they may be having regardless of whether these may be academic or personal.

The greatest challenge of the PhD Association pertains to a sometimes limited participation in some of the social activities. The PhD Association covers a range of ages, disciplines, skills, interests, nationalities, and career stages. As such there is often a struggle to organise academic workshops, professional opportunities, and social activities that appeal to a large enough percentage of the PhD Association's members. In order to overcome this, the Co-chairs ensure that they maintain constant communication with members and promote a participative environment.

Other UK examples

Part-time professional doctorate for home and international students

Example of practice

The part-time Doctorate in Education (EdD) for both home and international students at the Institute of Education in London

The Doctor in Education EdD is a part-time doctorate which includes assessed taught courses, research-focused workshops and supervised original research. The Doctor in Education (International) EdD is the corresponding international programme that has been designed as an extension of the original EdD programme and is taught both intensively in London and by correspondence in students' own countries. The EdD (International) degree programme also forms part of a dual award being offered by the Institute in partnership with the National Institute of Education, Nanyang Technological University, Singapore (NIE).

The EdD started in 1996 and the International EdD in 2001. The programme is designed for an international body of practitioners who would like to extend their professional expertise and training and develop skills in research, evaluation and reflection on practice. It is relevant to all academic staff in universities and colleges, school teachers, health professionals, and other professionals, including those working in international organisations. It is also suitable for senior administrators in schools, universities and educational and government bodies.

It has approximately 50 applicants each year from around the globe from Asia (China, India, Iran, Japan, Pakistan, Qatar, Saudi Arabia, Singapore, South Korea, Taiwan, United Arab Emirates); Africa (Kenya, Morocco, Mozambique, South Africa, Swaziland, Tanzania); America (Argentina, Bahamas, Brazil, Canada, Chile, Trinidad, USA) and Europe (Cyprus, Germany, Greece, Iceland, Kazakhstan, Malta, Norway). About two-thirds are offered a place, resulting in an annual cohort of approximately 15 students.

The criteria for admission is four years' professional experience in education, a good master's degree, and fluency in the English language. The delivery is part-time but it is not a distance programme. The Institute requires one week of attendance per term initially with taught modules delivered through lectures, seminars and workshops and later, research weeks which are more varied where students use the library, meet supervisors and so on.

The programme is supported electronically by email, Skype, etc. It aims to link professional experience to research. Students often come with professional experience but little experience of research. The approach is to develop an international, intercultural or comparative dimension. There are four taught modules (each with a 5,000 word assessment), two pieces of research (an institution-focused study and a thesis). The taught modules are Foundations of Professionalism, Methods of Enquiry 1 (MoE1) (Philosophical, Design and Ethics), International Education, and Methods of Enquiry 2 (MoE2) (Practical and Data collection and analysis).

The institution-focused study (IFS) is research based on one institution, usually the student's own workplace, and is typically concerned with professional activity. This is an empirical study which follows through MoE1/MoE2. It is submitted at the end of the first year in the form of a 20,000-word report that is double marked and externally moderated. The thesis is typically submitted after a further two to three years. It must be linked to professional activity and is usually developed from IFS. It is of the order of 45,000 words, assessed by viva, and has one internal examiner and one external examiner.

E-learning doctorate

Example of practice - University of Liverpool 100% Online Doctorate Degree Programmes⁴⁹

In partnership with Laureate Online Education, the e-learning partner of the University of Liverpool, the University of Liverpool offers two completely online Professional Doctorates: Doctor of Education - Higher Education (EdD) and Doctor of Business Administration (DBA).

A quote from the website states:

'Laureate Online Education, the University of Liverpool's exclusive worldwide e-learning partner, has developed a 100% online learning environment which enables you to fit a master's or doctorate into your life and acquire relevant, up to date knowledge to boost your career. Join over 3,500 graduates from more than 130 countries that have taken the first step in giving their career a new direction.'

Further work is required to investigate how this works in practice for both part-time and international PGRs working in higher education or business administration.

⁴⁹ www.uol.ohcampus.com

Denmark

Recruiting and supporting international students in Denmark

Example of practice - Aarhus University⁵⁰

In line with other countries, PhD education in Denmark has undergone significant development over the course of the last 10 years. This development has seen a transition from the PhD education as an apprenticeship exclusively centred on participation in a research project to a structured educational programme that, in addition to research, contains additional mandatory elements such as coursework, travel and/or study abroad, and knowledge dissemination.

Aarhus University has recently merged with many other local and national institutions, and is currently undergoing structural reorganisation. The University has recently restructured from 55 departments to 26. The University management has decided to set up six interdisciplinary centres and the University's four core activities are stated as being: research, talent development, knowledge exchange, and education. The original eight faculties, each with its own graduate school, have been reduced to four which has resulted in four new graduate schools being formed in 2011 - Graduate School of Arts, Graduate School of Health, Graduate School of Business and Social Sciences, and Graduate School of Science and Technology. All PhD programmes have a very strong requirement for training - this includes taking compulsory courses and, in the case of Aarhus, there is a requirement for PhD scholars to achieve 30 ECTS by the end of year two.

In Aarhus, supervisors are appointed by the Vice-Dean. The population of PhD students in 2008 was 1,430 (481 newly admitted) which was up from 1,194 in 2007. Aarhus aims to double PhD numbers to 2,800 by 2014 and have indicated that there will be increased financial support provided under the Danish Government's globalisation strategy to help achieve this. Currently, Aarhus University admits 550 research talents to its PhD programmes and it is common in northern European universities for doctoral candidates to be considered as academic staff.

Recruitment of international postgraduate students is recognised as critical in strengthening the institution's international profile. The University of Aarhus recognises the competitiveness of the international market and have taken considered steps to address this: the majority of postgraduate programmes are taught in English and there are coherent measures in place to provide accessible support, both academic and non-academic, to international students and their families. A key support service for international PhDs is the University's International Centre and (recently established) International Help Desk at the International Centre, which has quickly become a very professional and highly appreciated service. The Help Desk works to ensure that foreign PhD students (and postdocs) are quickly and effectively integrated into the university community, both before and after their arrival, and provides information on Denmark, the city and Aarhus University.

It is a place where PhDs can get practical and administrative help to solve any problems arising in connection with their studies and work at Aarhus University or their residence in Denmark. Other support provided is a newsletter, an orientation day and a Facebook page for International PhD students and staff at Aarhus University. The Staff Mobility Unit helpdesk provides information on residence and

⁵⁰ www.au.dk/en/phd

work permits, taxation, housing, and Danish courses, as well as information for spouses and children and details of international opportunities for home students and staff.

PhD Portal⁵¹ is a PhD portal providing information for students. It has details of the purpose built PhD centre - the PhD House, PhD courses, latest news, events, and so on. For international PhDs it links to the International Centre. The 'Working Across Cultures Course' and the 'Learn Danish Online Course' are particularly relevant for international PhD students.

For international undergraduate students, a satisfaction survey can be accessed.⁵² This has relevance to international PGRs by demonstrating the University's commitment to international student issues, interest in their feedback and its aim to retain the best PGRs.

Japan

Requirements for Scottish and other overseas students studying in Tokyo

Example of practice - Requirements for overseas students admitted to doctoral programmes at the University of Tokyo⁵³

The University of Tokyo has 11 graduate schools: Humanities and Sociology, Education, Law and Politics, Economics, Science, Engineering, Medicine, Mathematical Sciences, Frontier Sciences, Information Science and Technology, and Public Policy (for Japanese students only).

The University of Tokyo require candidates who wish to enrol in a master's or a doctoral programme to take an entrance examination prior to admission. Further, as most of the lectures at the University of Tokyo graduate schools are conducted in Japanese, applicants are advised to master Japanese before enrolment and to make enquires to their chosen graduate school in good time; approximately one year prior to admission. All graduate schools require a set level of proficiency in the Japanese language.

Currently, the University of Tokyo has provision for international research who wish to engage in research activities in specialised fields at a University of Tokyo graduate school for six to 12 months as part of a PGR programme elsewhere. No degrees or qualifications will be awarded to postgraduate research students by the University of Tokyo after the completion of the research term.

Australia

Research communication programme for international research students

Example of practice - the Integrated Bridging Program Research (IBP-R) for International Research Students at the University of Adelaide (IBP-R)⁵⁴

The IBP-R is a compulsory research communication programme for international postgraduate research students. The purpose of the programme is to support international research students in their development within their disciplines. The programme aims to make explicit the specific discipline-related expectations of academic writing and oral presentation.

⁵² www.au.dk/fileadmin/www.au.dk/Internationalt_Center/International_Student_Survey_Results_October_2010.pdf

⁵³ www.u-tokyo.ac.jp/res03/i13_e.html

⁵⁴ www.adelaide.edu.au/red/ibp

Particular goals of the programme are to: provide induction into the academic, linguistic and cultural conventions relating to postgraduate research in the students' own disciplines and paradigms; foster students' agency and autonomy in negotiating research and language outcomes; develop independent communication skills and proficiency in English appropriate to the students' own area of specialisation; develop techniques of citing and attribution to express critical perspective; and develop spoken English and presentation skills for communicating research.

Participation in the full programme requires PGRs to commit to four hours per week for 13 weeks. Assessments are practical and applied to the PGR's research in that they are required to complete two drafts of their research proposal (or an alternative negotiated research document) and to present a 20 minute seminar in the IBP-R class. Interestingly, all three assignments are co-marked by the PGR's supervisor and the IBP-R seminar lecturer.

Annex 5

Examples of structured doctoral education that help to maintain standards and quality

The Netherlands

An outline of the Netherlands PhD Structure (attributed to Hans Sonneveld, (2010) Sonneveld, Hans, Doctoral Education in the Netherlands, 2010 - A brief history and a silent revolution. EUA- Council for Doctoral Education -News, December 2010, issue 10, 2-4.) Further information and publications related to can be found at 'The Netherlands Centre for Graduate and Research Schools'.⁵⁵

The Netherlands has a system of local graduate schools with national research schools accredited by the Royal Netherlands Academy of Arts and Sciences. Doctoral students are employees and prepare their PhD proposal as master's students. Supervisor quality and professional training is monitored and for each institution, both external and internal quality assurance procedures apply.

Example of practice - Wageningen Institute of Animal Sciences (WIAS), (Peer Reviewed in 2009 by Dominic Houlihan)

Quality Control of Research is ensured by: PhD project - two or three external reviewers assess science and the feasibility; selection - normal job application; OS - entrance exam and English language lessons; progression - 18 months - go/no go; final assessment - draft PhD approved by exam committee before public defence of thesis.

Education and Training requirements are: Training and Supervision Plan (TSP) for every PhD; PhD to Supervisor + Education Coordinator to WIAS Education Committee (within six months, then after two years); 30-60 ECTS (1ECTS=28 hours of study); Mandatory WIAS Intro Course and Philosophy of Science and Ethics Course about one-third from WIAS Mid-term job assessment; WIAS Education Certificate issued at graduation.

Ireland

In alignment with the EHEA, in Ireland higher education is referred to as third level education. To promote its importance and distinctiveness, graduate education is increasingly referred to as the 'Fourth Level'. Two key players in the quality and enhancement of doctoral education are the Irish Universities Association (IUA) and Irish Universities Quality Board.⁵⁷ The IUA is coordinating a Deans of Graduate Studies Network - the Fourth Level Network - to lead and inform the development of the fourth level.

Key elements of Fourth Level Ireland are: core master's and PhD programmes; feeder pathways which will enhance access to the best of university education; new programmes of lifelong learning and skills development; strong links to external stakeholders with opportunities for placements in relevant economic sectors; taught elements in generic skills and advanced disciplinary courses; teaching/tutorial experience.

⁵⁵ www.phdcentre.eu/en/publications

⁵⁶ www.iua.ie

⁵⁷ www.iuqb.ie/en/homepage.aspx

During 2008, the seven Irish universities came together to agree on the context, components and definition of the Irish structured doctorate. Thus in the spring of 2009 the IUA issued a statement on the context and the definition of the developing Irish structured doctorate. In June 2009, the IUQB published 'Good Practice in the Organisation of PhD Programmes in Irish Higher Education',⁵⁸ a second edition of the document reflecting changes that have taken place since 2005 in the organisation of PhD programmes and recognising that the guidelines are used both within and outside of the university sector. This is a very comprehensive publication and is the fifth document in a series of good practice guides.

NUI Maynooth was the first Irish university to provide structured master's and PhD programmes across Arts, Science and Engineering and Social Sciences to all its new entrants. The goal of the structured programme is to provide students with high quality research experience, and integrated support for professional career development.

Example of practice - NUI Maynooth Structured PhD (attributed to G. Honor Fagan, Chair of IUA Deans of Graduate Studies Group)

Structured PhD education is currently being mainstreamed at NUI Maynooth. The taught credits are taken into account in the annual review progress and the titles of modules and assessment grades of Pass, Distinction or Did Not Complete are inserted in the student's transcript. The student's original research as presented in the thesis (or in such form appropriate to their discipline) is the sole means of assessment for the award of the PhD.

The NUI Maynooth Structured PhD falls somewhere between the programme offerings of the United States institutionalised graduate school (there is one institutionalised graduate school at NUI Maynooth but less intensity of number of modules required) and the Finnish network model which is particularly well embedded in the international research system, and offers a number of good examples of excellent interinstitutional and international cooperation.

The elements and features of NUI Maynooth Structured PhD are that it is student-centred, research-led, international, and governed by a graduate school.

Student-centred

The student on registration holds an introductory meeting with the primary supervisor and their research team/committee, where a personalised programme of research investigation is balanced with supporting modules which are signed up to once identified. Involves researching alongside and interacting with a cohort of doctoral students.

Formal accredited specialist modules (involving interinstitutional delivery and world class expert input), generic skills modules (normally faculty-based), professional skills modules (normally department/research institute-based, but with tangible involvement with the wider industry and business context), and transferable skills modules (entrepreneurship, innovation research specific to research subject).

Interactions promoted with industry, business or public/community service. Webportal student-centred learning environment featuring e-portfolios and commercial networking. Annual President's prize for innovation and creativity. Suites of generic and transferable modules provided on a faculty basis. Suites of specialist modules provided on an interinstitutional basis.

⁵⁸ www.iuqb.ie/info/good_practice_guides.aspx

Research-led

Embedded in a thematically aligned community of researchers. Given access to and often 'placed' in the research team's networks of, and links to, industry, business and/or services. Commercial and social relevance is built into the design of the cutting edge research, specialist research modules and transferable modules. These are often built in partnership with industry. The student's training and research is developed in the light of these links between academia and practice in the spirit of evidence-based policy and practice.

International

Global element doctoral education now necessarily involves integrating an international, intercultural and global dimension as a key purpose. This incorporates both the cross-border type of internationalisation (where finance allows in the form of international travel funds/supports for lab visits, new technology familiarisation and conference presentations), and internationalisation at home (benchmarking with world-class research centres, technology-enhanced sharing of specialist knowledge with international research networks of excellence, close cooperation with programmes abroad, and provision of doctoral level modules on global challenges).

Governed by a graduate school

Student involvement in policy development through a closely representative Postgraduate Feedback Council (34 members, four meetings annually). Student-centred culture of learning developed through Postgraduate Forum (four meetings annually). Training, support and monitoring in supervision to enhance its professionalisation. Formal monitoring of progression by research teams/panels reporting minimally on an annual basis to the Graduate Studies Office Publishing of completion rates. Links developed between under and postgraduate education through internships. ITS research module supporting data collection and analysis.

Physics PhDs in Scotland

Example of practice - The SUPA Graduate School⁵⁹

The Scottish Universities Physics Alliance (SUPA) is an exciting initiative that has formed a research alliance between the physics and astronomy departments of eight Scottish universities. These currently include: University of Aberdeen, University of Dundee, University of Edinburgh, University of Glasgow, Heriot-Watt University, University of St Andrews, University of Strathclyde, and the University of the West of Scotland.

SUPA seeks to place Scotland at the forefront of physics research globally through an interinstitutional management structure and is jointly funded by the Scottish Funding Council (SFC) and the constituent universities. There is a coherent staffing strategy and a Scotland-wide research strategy. SUPA facilitates enhanced collaborative research programmes and the pooling of equipment and resources including postgraduate education and training of researchers.⁶⁰ One of SUPA's identified successes is its pan-Scotland Physics Graduate School.

The SUPA Graduate School is staffed by a Director, a Secretary and an IT Support Officer, and provides postgraduate education and training for Scottish physicists.

⁵⁹ www.supa.ac.uk/Graduate_School/Graduate_School.htm

⁶⁰ Further details of SUPA can be found on the main website: www.supa.ac.uk.

An integral component of the SUPA Graduate School is the Graduate School Management Committee (GSMC) which provides advice and support to the Graduate School Director in the development of the graduate school.

Since 2006, the SUPA Graduate School has built eight video conferencing training suites across Scotland, set up MySUPA (a purpose-built VLE adapted from Moodle), run an annual international studentship competition and an annual postgraduate training programme consisting of 60+ courses across seven technical themes (including specialist courses), advanced training workshops, summer schools, master's courses from Distinguished Visitors, and generic skills training. Education and training is delivered by face-to-face sessions, utilising videoconferencing technology and online, by web-based training materials. SUPA utilises departmental, university and research council generic skills training as well as employing specialist external providers. Generally, training is developed specifically for the physics community, for example C++/Object Oriented Programming, Shell Scripts, Data Analysis, Entrepreneurship and Career Development. However, the targeted entrepreneurship module, dealing with marketing, intellectual property, commercialisation, patents, and networking, has now become a cross-pool event, encompassing SUPA, SULSA, SICSA and SINAPSE, and a Biology Summer School is run by SULSA and SUPA for Physics and Life Sciences (PaLS) students.

From 2008 onwards, every SUPA PhD student has been required to complete a minimum of 40 hours of lectures plus coursework and assessment of technical studies, and 20 hours or four days of generic or transferable skills in the first two years of their PhD. In some themes, such as particle physics theory, the requirement is much higher. Results are held on a master database with the facility to print out transcripts of continuing professional development for early stage researchers. Guidance is given on these requirements to all first-year PhD students at the annual SUPA-wide Induction Event. There are approximately 520 PhDs within SUPA with around 150 joining each year.

The graduate school has developed structures to consolidate and quality-assure education and training of SUPA PhDs across eight Scottish universities. The success of the graduate school is demonstrated by its involvement in strategic partnerships and its positive reviews.

SUPA Graduate School Partnerships

The excellence in research demonstrated in condensed matter at the universities of St Andrews, Edinburgh and Heriot-Watt, coupled with the infrastructure of the SUPA Graduate School, resulted in the award of an Engineering and Physical Science Research Council (EPSRC) Doctoral Training Centre - The Scottish Condensed Matter Doctoral Training Centre. This was a £6 million five-year project with 50 doctoral studentships in Condensed Matter and Materials Physics (CMMP).

The SUPA Graduate School and the SUPA Knowledge Exchange Team were awarded a £1.6 million SFC SPIRIT project which includes 12 industrial doctoral studentships in Physics and Life Sciences (PaLS). SUPA and SULSA will work together on this project to maximise support for and from Scottish SMEs. In 2009 the Industrial Doctorate Centre (IDC) in Optics and Photonics Technologies, a collaboration between Heriot-Watt, Strathclyde, St Andrews and Glasgow Universities within SUPA's Photonics Theme, received renewed funding of £5 million from EPSRC to

take on an additional five intakes of 10 doctoral students. The IDC is enhanced by access to the graduate school video conferencing activities and staff expertise provided through SUPA. Two partnerships were funded by EPSRC in 2011 - a CDT Lite in the Application of Next Generation Accelerators and a CDT Lite in Magnetic Resonance Technology. Each of the above were allocated £4 million with studentships based in Strathclyde, St Andrews, Aberdeen and Dundee Universities and partners external to the Alliance.

SUPA Graduate School Reviews

An international review of the graduate school stated 'Overall we believe that the SUPA Graduate School is moving in the right direction to provide a training which is competitive at the world level'. A review of SUPA for SFC by SQW Consulting stated that 'the Graduate School is exceeding expectations'.

Example of practice - The Scottish Graduate School of Social Science⁶¹

Another example of a Scottish collaborative model is 'The Scottish Graduate School of Social Science' - a collaboration between Scotland's universities to provide excellent research training to doctoral students in the social sciences. Central to the Graduate School is the ESRC Doctoral Training Centre in Scotland. This is the largest ESRC UK-wide network of training centres, is supported by £20 million and offers ESRC-accredited training in 24 different training pathways - each involving a collaboration across the best departments at eight Scottish universities: Aberdeen, Dundee, Edinburgh, Glasgow, Heriot-Watt, St Andrews, Stirling, and Strathclyde. The DTC was established in 2011 and has 65 studentships every year for a five-year period.

The first intake of students was September 2011. Students will build a mix of social science research skills and career development skills, including training in how to work with government, business and the voluntary sector in Scotland and beyond to maximise the impact of social science research.

Training is available in all the major fields of social science, along with a series of innovative training pathways focused on major policy challenges like the environment and climate change, and demographic change. Students also have access to a broad range of language training to support international research, including specialist immersion training in Arabic. The Scottish Funding Council has awarded around £1.3 million to support the DTC and the graduate school in delivering world-class training and securing the benefits social science research delivers for the Scottish economy and Scottish society. The ESRC funding was £20 million.

⁶¹ www.socsciscotland.ac.uk/home

Annex 6

Examples of UK Centres for doctoral training

Example of practice - University of Strathclyde Medical Devices and Related Materials

Established in 2003, the Strathclyde Doctoral Training Centre in Medical Devices is one of 17 Centres for Doctoral Training at the Life Sciences Interface. Funded by the UK Engineering and Physical Sciences Research Council (EPSRC) Life Sciences Programme, the DTC offers a Doctor of Engineering (EngD) degree programme in Medical Devices that delivers engineers and physical scientists with full research training at the life sciences interface.

The Doctor of Engineering (EngD) programme aims to train engineers and physical scientists so that they are competent to carry out multidisciplinary research in the field of medical devices and related technologies. The DTC is allied to the UK Health Technologies Knowledge Transfer Network. In providing support for up to 40 students at any one time the DTC contributes to developing and supporting critical mass in this important area.

The programme aims to: produce doctoral graduates capable of developing careers in medical devices (research and industrial) independent of the subject of their first degree; and foster a multidisciplinary learning environment in which cross-fertilisation of ideas and concepts from science, medicine and engineering can merge to facilitate the development of relevant clinical and industrial research.

The DTC operates across traditional departmental and faculty boundaries. Participating departments are from the Faculty of Engineering: Electronics and Electrical Engineering, Chemical & Process Engineering; and from the Strathclyde Institute of Pharmacy and Biomedical Sciences (SIPBS): Biosciences, Pharmaceutical Sciences, Physiology, and Pharmacology.

Associated with every research project is a company or a clinical group (or both) in order to ensure that the research is directly relevant to actual end-user groups in the field of medical devices.

Example of practice - the STOR-i Doctoral Training Centre⁶²

The STOR-i Doctoral Training Centre, based at Lancaster University, is a joint venture between the departments of Mathematics and Statistics and Management Science. It is backed by a £4.3 million award from EPSRC and offers a four-year PhD programme in Statistics and Operational Research (STOR) developed and delivered with industrial partners.

The first year of the programme comprises taught courses, projects and group activities giving a robust grounding in STOR, developing key research skills, and identifying a research agenda. On successful completion of the first year, students progress to a PhD in years two to four, when they encounter real-life commercial challenges, develop leading STOR research, and make a real impact on major industrial and scientific applications.

They also develop and practice the skills required for rapid career progression.

⁶² www.stor-i.lancs.ac.uk

Example of practice - the Manchester Doctoral College - Coordination of several DTCs⁶³

The University of Manchester has been successful in attracting EPSRC and ESRC DTCs and as a result has set up The Manchester Doctoral College (MDC), an umbrella organisation for the University's DTCs.

Set up 'virtually' in 2010, the initial aims were to: provide coordination across the DTCs (with a view to rationalising the administrative processes); present a consistent approach across all the DTCs; share good practice; and promote a DTC brand.

From August 2011, the MDC has been the main vehicle for Graduate Education within the University of Manchester. It has set up a new MDC Management Committee managing all Graduate Education (with representatives from CDTs and faculties), put in place a restructured administration, and moved into a new MDC space in a cross-DTC cohort building. Currently, the MDC is investigating the wider implication of the DTC model within the University of Manchester.

In the development process, the MDC has many advantages but also many challenges. The advantages are: protecting interdisciplinarity; tailoring support for the DTCs; promoting the DTC model; and streamlining processes to make them more efficient.

Some of the challenges encountered in the set up process have been: dual accountability - faculty and/or MDC; creating a two-tier system; helping students understand and relate to the MDC brand; and providing a growing service with limited resource.

Example of practice - The University of Sussex Doctoral School⁶⁴

This is a similar example to that of The Scottish Graduate School of Social Science with its embedded ESRC Doctoral Centre, but in this instance the University of Sussex Doctoral School is cross-disciplinary across the 13 schools in the University. The model demonstrates where an institution will embed a Research Council-funded DTC within its umbrella Doctoral School. A review of the University of Sussex Doctoral School shows a very dynamic organisation with a doctoral blog, an interdisciplinary doctoral journal, a mentoring scheme, and in-depth detailed support information for doctoral researchers, research staff, supervisors and principal investigators (PIs).

⁶³ www.mdc.manchester.ac.uk

⁶⁴ www.sussex.ac.uk/doctorschool/internal/index (blog: <http://doctorschool.wordpress.com/index>).

Annex 7

Examples of practice in building critical mass and diversity

Europe

Example of practice - Irish Universities Association and Fourth Level Ireland - University Graduate Education⁶⁵

The Irish Universities Association (IUA) is a representative body for Ireland's seven universities formed to facilitate collaboration and to develop collective strategy and policy, advancing third and fourth level education and research. Ireland has introduced a four-year structured PhD often running in collaborative mode across universities. A Deans of Graduate Studies Network - the Fourth Level Network - is leading and informing the development of the fourth level.⁶⁶

This is the structured PhD Programme in Biomedical Engineering and Regenerative Medicine (BMERM) based at NUI Galway (but delivered by a core partnership of institutions): National University of Ireland Galway (Administrative Coordinator), University of Limerick and University College Cork (and linked with a wider consortium of partner institutions nationally and internationally).

Unfortunately the recession in Ireland and reduced funding has halted the introduction of the four-year structured PhD model across all disciplines and universities. Hence as with other countries, there are different models running in parallel.

Example of practice - the German Initiative for Excellence⁶⁷

A total of €1.9 billion was made available to universities in the first two selection rounds between 2006 and 2012, 75 percent of which was provided by the Federal Government.

The Initiative for Excellence competition comprises three project-oriented funding lines, which are to be continued. One of the funding lines is Research Schools for young scientists offering structured PhD programmes in excellent research environments and in broad areas of science. In the first two rounds, around 40 Research Schools were established, each receiving €1 million per year for five years.⁶⁸

Example of practice - the Danish national political science PhD programme (Polforsk)⁶⁹

In response to a requirement to provide high quality and specialised PhD courses in small subject areas, the Danish government has set up national PhD programmes. Polforsk is one such programme. The purpose of the Polforsk Postgraduate School is to promote collaboration in the education of PhD students across the entire field of political science in Denmark. It is supported by the Danish Ministry of Science, Technology and Innovation.

The funding has enabled departments to collaborate to share courses and to develop new highly specialised courses. The institutions in the Polforsk network

⁶⁵ www.4thlevelireland.ie and www.iua.ie.

⁶⁶ An example of a structured PhD Programme can be accessed at www.nuigalway.ie/graduatestudies/Research_Degrees/structured_phds.html.

⁶⁷ www.bmbf.de/en/1321.php

⁶⁸ Details of the Research Schools funded can be found at http://en.wikipedia.org/wiki/German_Universities_Excellence_Initiative#Winners:_Graduate_Schools.

⁶⁹ <http://polforsk.dk>

are: Department of Political Science, University of Copenhagen; Department of Political Science, University of Aarhus; Department of Political Science and Public Management, University of Southern Denmark; Department for Society and Globalisation, Roskilde University; Department of Economics, Politics and Public Administration, Aalborg University; Danish School of Public Administration, and Danish Institute for International Studies.

Example of practice - The TU Delft Graduate School, Netherlands⁷⁰

At the Delft University of Technology (TU Delft), and in a move to improve the position of TU Delft as a postgraduate institution, the University has set up a graduate school. It aims to improve supervision and instruction, reduce the drop-out rate and completion time for PhDs, and provide reliable management information about PhD candidates. The TU Delft Graduate School consists of eight faculty graduate schools each with its own graduate programmes and subject-specific doctoral instruction. PhD students are allocated a mentor, form a peer network and have their degree certificates enhanced. Supervisors are supported in their recruitment and selection activities.

The graduate school is run by a University Graduate Office that handles the central intake on 1 September, records the PhD progression, and coordinates general training courses common to each faculty as well as maintaining a website and providing information.

The University Graduate Office also provides a careers adviser and a psychologist. Each of the eight faculty graduate schools is supported by a faculty graduate office that provides local support for students and staff and information about teaching programmes. The University Graduate Office coordinates the faculty graduate schools. The TU Delft PhD student association 'Promood' has been instrumental in the set-up of the TU Delft Graduate School.

Australia

Examples of practice - the University of Melbourne

The University of Melbourne has a large portfolio of over 300 development courses for working professionals as well as master's courses and research degrees such as PhDs and Professional Doctorates. The graduate school model of education was introduced in 2007. Now the University has 15 graduate schools which offer a range of focused and intense master's courses to prepare students for professional careers such as doctor, lawyer, engineer, teacher, economist, entrepreneur, and so on.⁷¹

Aligned with this is the Melbourne School of Graduate Research (MSGR).⁷² The MSGR is responsible for graduate research students (PhD, Research Master's and Professional Doctorates). It is led by the Pro Vice-Chancellor (Graduate Research) and the MSGR Executive. With the Graduate Student Association (GSA), it jointly administers the Graduate Centre that provides meeting rooms, study spaces, social facilities and computer labs for graduate students. The MSGR offers a selection of jointly awarded doctoral programmes.

⁷⁰ <http://home.tudelft.nl/en/research/graduate-school>

⁷¹ www.futurestudents.unimelb.edu.au/explore/graduate-schools

⁷² <http://gradresearch.unimelb.edu.au>

Example of practice - Monash University⁷³

At Monash, there are two ways to study for a postgraduate degree - by coursework or by research.

Higher degrees by research include PhDs, Professional Doctorates, MPhils and Master's by Research and Master's by Research and Coursework. The coursework postgraduate degrees can be undertaken on-campus and by distance learning. As with the University of Melbourne, Monash offers around 300 postgraduate coursework programmes, including graduate certificates and diplomas, postgraduate certificates and diplomas, master's by coursework and an interesting combination of master's by a combination of research and coursework. Both Melbourne and Monash are members of The Group of Eight (Go8) which is a coalition of leading Australian universities.

Other Go8 members are the University of New South Wales, the University of Western Australia, the University of Adelaide, the Australian National University, the University of Queensland, and the University of Sydney. The Go8 Deans of Graduate Studies Committee enables members of the group to collaborate on common issues of doctoral research and training.

Example of practice - the University of Newcastle⁷⁴

The Office of Graduate Studies at the University of Newcastle, Australia provides administration and support for Research Higher Degrees. Similarly to Melbourne, it is led by a Pro Vice-Chancellor of Graduate Research supported by a committee representing the faculties/departments and a central development and administration team. While not a member of the Go8, the University of Newcastle is represented on the council of Australian Deans and Directors of Graduate Studies (DDoGS).

North America

Example of practice - Stanford University

'Graduate programmes' in Stanford, as they are called, have great diversity across the university. Some departments admit students who are interested only in a master's programme; others award master's degrees only to students enrolled in other degree programmes. Most departments admit students for doctoral study directly from a bachelor's programme, although some require completion of a master's degree before approval for doctoral work. For each Stanford advanced degree, there is an approved course of study that meets University and department requirements as outlined in the Stanford Bulletin.⁷⁵

The Office of the Vice Provost for Graduate Education (VPGE), set up in January 2007, ensures university-wide standards and values, and fosters cross-disciplinary collaboration by working collaboratively across each of the seven schools - Graduate School of Business, School of Earth Sciences, School of Education, School of Engineering, School of Humanities and Science, School of Law, and School of Medicine. The University has 65 departments in what they call 'post-baccalaureate study' and around 8,000 students.⁷⁶

⁷³ www.monash.edu.au/study/options/postgraduate.html

⁷⁴ www.newcastle.edu.au/research/research-higher-degree-study.html

⁷⁵ www.stanford.edu/dept/registrar/bulletin/4067.htm

⁷⁶ Information on skills workshops, policies and procedures, funding and the graduate student/adviser relationship is clearly presented for postgraduate students and can be downloaded from the Office of VPGE website: <http://vpge.stanford.edu/index.html>.

In tandem with the Office of the VPGE is the Office of Graduate Admissions which is part of the Office of the University Registrar and verifies the decisions of the academic departments by checking transcripts, English qualifications and so on. It also gives students a web introduction to Stanford and provides useful practical help.⁷⁷

Example of practice - the University of Michigan⁷⁸

The Rackham Graduate School looks after the University of Michigan's 7,000 graduate students in partnership with academic departments. As with the Stanford model, the Graduate School's mission is to provide excellence in graduate education and research.

The School runs interdisciplinary skills courses and provides information on the application process, funding, policies and support for graduate students.

⁷⁷ <http://studentaffairs.stanford.edu/gradadmissions/programs>

⁷⁸ www.rackham.umich.edu

Annex 8

Examples of support for postgraduate teachers

UK

Example of practice - Preparation to support first-year biology teaching at the University of Glasgow

Level One Biology is the largest first-year biology course in Western Europe. With around 700 students annually, it is necessary to repeat lab practical classes up to 16 times per week. Each lab session requires three Graduate Teaching Assistants (GTAs) in addition to the lab leader, who is a member of academic staff.

Traditionally there has always been a Monday morning training meeting prior to each lab class, which took the form of a mini lecture. In the past two years, the University has developed the training and support given to GTAs to include:

- practical aspect: GTAs work through the lab experiments in groups composed of experienced GTAs who mentor the less experienced individuals
- Moodle site for peer and staff support, lab resources, teaching resources
- feedback from GTAs to inform development of labs
- ensure that at least one experienced GTA is in each lab class
- assists new GTAs
- assists new lab leaders
- expansion of role to include marking, lab leading, tutorials
- promote awareness and discussion of the importance of the role of the GTA
- develop awareness of issues in teaching through interaction with literature and other resources
- development of attitudinal change: raising awareness of the role of the GTA as a 'teacher' rather than a 'helper'.

The development of support for GTAs benefits all stakeholders: undergraduate students benefit from well informed, enthusiastic GTAs who are well versed in biology topics outwith their own area of expertise; the GTAs are supported in their development as teachers, which supplements the mandatory introductory GTA training given by the Learning & Teaching Centre; GTAs express an interest in developing their opportunities within teaching.

GTAs are offered opportunities to mark or lead tutorials and labs. Lab leaders benefit by having confidence that their GTAs are able to work with students without supervision, leaving lab leaders to concentrate on their role.

One of the most successful aspects of the change in Monday training meetings was the introduction of the 'hands-on' session. Experienced GTAs take new GTAs through the experimental process; for example, in the sheep heart dissection, common errors that students make can be pointed out to new GTAs.

The dedicated Moodle site is useful for both staff and GTAs. There are extra lab resources, information on what worked well (from GTAs who teach in sessions early in the week), issues to look out for, and problems to avoid. GTAs also have access to lecture notes so they are informed of the information available to students relating to a particular lab.

Although GTAs generally teach the same students in the same session, a weekly timetable is also produced so that GTAs are given up to date information on any changes.

GTAs now receive end of semester feedback from their undergraduate students. This takes the form of 'Two stars and a Wish' where students give feedback on two aspects of their GTA's teaching that they like, and one thing that they would like them to change. This has proved very popular with GTAs as it gives them confidence that they are doing a good job.

Level One Biology is in a unique position, having a dedicated weekly time for directed support and training. One of the challenges of expanding this type of support to other courses is the lack of time available for GTAs and staff to collaborate in the support of other courses.

Another challenge is to encourage GTAs to engage with teaching literature as they are primarily early career researchers in Life Sciences. PhD supervisors may not consider that GTAs are learning anything relevant to their PhD studies from teaching undergraduates, and this may impact on the GTAs' perception of themselves as a 'helper' rather than a 'teacher'.

Example of practice - Durham University Learning and Teaching Award

The University of Durham has developed training for early career researchers and part-time teachers involved in teaching and supporting learning and assessment. Those who successfully complete the programme and pass the associated assessment receive the Durham University Teaching and Learning Award. The programme is assessed summatively by a portfolio. A blended learning approach is used to deliver the programme - e-learning, face-to-face, mentoring, private study, and so on.

Core workshops in the programme are as follows: Introduction, Teaching and the support of learning, Contributing to the design and planning of learning activities and/or study, Assessment and/or giving feedback, Developing effective learning environments and learner support, Evaluating practice and personal development, and Integrating scholarship, research and professional activities with teaching and supporting learning.

As well as the Durham University Learning and Teaching Award, the University also runs a mandatory two-session event - Teaching Induction for Postgraduates. Students who successfully complete both sessions are awarded a certificate and are permitted to undertake teaching duties at the University. The first session is 'The Framework for Teaching and Learning at Durham' and is delivered online with an online assessment.

It covers Health and Safety, Diversity, and Student support mechanisms at Durham. The second session is entitled 'Preparing to Teach' and covers both Approaches to teaching and learning and Planning for learning and Assessment.

This part of the course is delivered via face-to-face workshops. Students must choose one from the following - Demonstrating, Small group teaching (in the Arts and Humanities and Social Sciences or in the Sciences), or Assessment (in the Arts and Humanities and Social Sciences or in the Sciences). Students are enrolled by their departments and are not permitted to undertake any teaching duties until they have completed both sessions. Along with the two mandatory sessions, students are also given the opportunity to take part in other sessions such as 'Preparing to Teach Large Groups' and 'Reviewing Your Teaching'.

Example of practice - University of Liverpool HEA accredited teaching qualification for postgraduate researchers (Christos Petichakis and Stuart McGugan)

The HEA-accredited course ran as a pilot at Liverpool University in 2010. It consists of two 10-credit independent modules - Supporting Student Learning and Assessing Student Learning.

Each module lasts for 10 weeks during which teaching and assessment tasks take place. Successful completion of both modules leads to Associate Status of the Higher Education Academy and exemption from Module 1 of the University's Certificate of Professional Studies in Learning & Teaching in Higher Education.

The University also offers a comprehensive Graduate Teaching Assistant Training (GTA) programme in four workshops: GTA Small Group Teaching Workshop, GTA Lecturing Workshop, GTA Essay Marking Workshop, and GTA Demonstrator Workshop.⁷⁹

North America

Example of practice - The Teaching Assistant Training and Teaching Opportunity (TATTO) at Emory University in Atlanta, Georgia⁸⁰

In a demanding doctoral programme where students are advised to concentrate on research, publications and conferences, it is often difficult to make time for teaching.

In response to this, the Emory Laney Graduate School has set up the TATTO programme. The programme is a mandatory degree requirement for all PhD students and prepares students for teaching in a graduated manner. The programme limits the number of teaching assistantships/associateships in the first four years of a PhD, thus ensuring that PhDs are not overtaxed or overwhelmed with teaching responsibilities.

The programme operates in four stages. The first stage of TATTO is a short course offered in late summer, before the new teaching year begins, and must be taken immediately prior to a student's first teaching experience. The second stage is discipline-specific in that departments provide training that addresses intellectual problems and teaching strategies.

The third stage of the TATTO programme is that of a teaching assistantship providing a controlled, carefully monitored initial teaching opportunity. The fourth stage presents the graduate student with a teaching opportunity with greater responsibilities. Here, the graduate school encourages a collaborative approach where the doctoral student and an academic staff member collaborate.

⁷⁹ Further details are available at www.liv.ac.uk/eddev/CPD/GTA/index.htm.

⁸⁰ www.graduateschool.emory.edu/resources/professional.php?entity_id=20

Stage 2 of the TATTO programme counts toward the total number of credit hours required for the PhD, but not towards the minimum 20 hours of course work. Stages 1, 3 and 4 do not count. Students who demonstrate exceptional teaching ability may be eligible to apply for appointment as Dean's Teaching Fellows.

Example of practice - The Teaching Assistants' Training Programme at the University of Toronto in Canada⁸¹

The University of Toronto has introduced the Teaching Assistants' Training Program (TATP) which is a peer-training programme for currently registered postgraduate students who will be working as teaching assistants.

Australia

Example of practice - the Postgraduate Teaching Internship Scheme at the Center for Advancement of Teaching and Learning at the University of Western Australia⁸²

The Postgraduate Teaching Internship Scheme allows promising doctoral research students (including professional doctoral students) to develop teaching skills in their fields and to undertake a programme of professional development activities during the course of their PhD candidature.

⁸¹ www.teaching.utoronto.ca/gsta/training/tatp.htm

⁸² www.catl.uwa.edu.au/programmes/development_opportunities/teaching_internship_scheme

Annex 9

Two Scottish examples of supporting the development of entrepreneurship

Example of practice - Embedding Entrepreneurship in Research Degrees at the University of Strathclyde

Strathclyde is developing a series of three linked entrepreneurship modules for MRes/PhD Research Degree students and Early Career Researchers throughout the University. This is an ongoing project, with two out of three modules developed and ready to roll out, and the third in the planning stage. The first of these modules, Technology Commercialisation and New Business Development, has been developed and is available to all students registered for research degrees (MRes, PhD) and early career researchers across all four Strathclyde Faculties.

The second module, Social Entrepreneurship, Commercialisation, New Business Development and Sustainability has been developed to help researchers understand and engage with not-for-profit commercial enterprises, and will be offered as both a credit-bearing module within Strathclyde Business School's MRes programme and as a module available to research students across the University who wish to pursue careers within the not-for-profit sector.

Finally, the University is in the process of developing a module on Enterprising Skills, with the goal of supporting the career aspirations of research students from across the University. Module design and delivery has been led by staff at the Hunter Centre for Entrepreneurship, an academic department dedicated to entrepreneurship teaching, research and knowledge exchange, in conjunction with staff from across Strathclyde Business School.

The entrepreneurship modules are designed to address the growing need for new academic entrants to acquire practical and enterprising skills that will enhance their ability to act as independent researchers and leaders of research teams. The skills acquired are a mix of soft skills (such as the ability to lead and influence, opportunity recognition, and personal network management) and hard skills (such as basic financial skills, marketing, new venture creation, and growth).

These skills are not only required by entrepreneurs and business leaders, they are increasingly required by academic staff in securing research funding and leading academic research teams. Those selecting the Technology Commercialisation and New Business Development module will be better prepared to identify commercial opportunities for technologies and lead potential spin-outs. Those selecting the Social Entrepreneurship module will have a stronger understanding of the skills required to develop new ventures within the social sphere - one of the fastest growing sectors of enterprise activity.

One advantage of offering entrepreneurship modules across the University is that students can benefit from the interdisciplinary environment: students undertaking these modules can be drawn from the range of academic disciplines and these modules offer a unique opportunity for interdisciplinary student interaction.

A key concern was ensuring the sustainability of these modules, both in terms of freeing up space in the curriculum and the financial returns for the department delivering the teaching modules. This was resolved by ensuring that each module is credit-bearing and offered as an elective choice for students across the University.

Example of practice - Enterprise support for doctoral researchers at the University of Edinburgh

Since 2007 the University has been in receipt of funding from the EPSRC for enterprise funding. This has been used to complement the University's existing programme of workshops on enterprise skills.

In 2010 they utilised the funding for several new initiatives. Firstly, a programme of mentoring sessions was established to bridge the gap between students leaving the workshop programme, and moving on to support from the commercialisation team.

These mentoring sessions guide participants through the process of developing a business plan, and help them enter business plan competitions in order to fund early stage companies. In addition, the EPSRC funding has established a prize for young technology companies as part of the University's business plan competition.

The University has also developed a funding stream which the commercialisation advisers can access, called 'Pipeline to pipeline' vouchers, and allows students to apply for £5,000 to pay for commercialisation advice and support, for example a market assessment; time with a patent agent; financial advice and so on. This has been very successful, and many companies have benefited.

The EPSRC funding has also been used to fund two residential courses in 2010. One was a workshop on enterprise run collaboratively with the University of Glasgow and the SUPA, SICSA and SINAPSE research pools, while one was designed for research students and staff at the University and covered the concept of an 'Enterprising Career'.

In 2010 the University also finalised two case studies of companies formed by early career researchers, an online module on intellectual property and entrepreneurship, and have participated in Vitae projects on entrepreneurship.

The University intends to run the residential courses again, as well as running the mentoring programme and offering the 'Pipeline to pipeline' vouchers for young companies. The University has also received requests to develop a residential course on social enterprise and hope this may be possible over the next year.

The University has been offering a strong programme of workshop provision in entrepreneurship since 2000, however it was felt that the University could offer researchers more targeted support. The receipt of the EPSRC funding allowed the University to significantly expand their programme, and pilot new initiatives such as residential courses and a mentoring programme.

It has been found that the mentoring programme was well received by participants, some of whom went on to win business plan competitions. The residential course was also very well attended, and had positive feedback. Some of the challenges faced relate to the general issue of participation - how to ensure researchers know about opportunities, and how to balance optimum participation rates while ensuring researchers have the level of support they require.

To overcome these issues for the mentoring programme, several different communication channels were used; for example participants were recruited through the workshop programme, and from the mailing lists of the commercialisation advisers. In this academic year the University is expanding this by holding drop-in sessions where potential participants can talk to the mentors directly, and find out whether the programme is suitable for their needs.

With the residential programme the University was very clear with participants that, while they were not paying a fee to attend, the University had invested significantly in running the programme. Attaching a monetary value to the cost of participation appeared to help keep attendance rates high throughout the course.



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