enhancement themes

Enhancing practice

Research-Teaching Linkages: enhancing graduate attributes

Overview: the aims, achievements and challenges from the Enhancement Theme

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Research-Teaching Linkages: enhancing graduate attributes

Overview: the aims, achievements and challenges from the Enhancement Theme

Alan Jenkins
Emeritus Professor
Oxford Brookes University

Preface

The approach to quality and standards in higher education (HE) in Scotland is enhancement led and learner centred. It was developed through a partnership of the Scottish Funding Council (SFC), Universities Scotland, the National Union of Students in Scotland (NUS Scotland) and the Quality Assurance Agency for Higher Education (QAA) Scotland. The Higher Education Academy has also joined that partnership. The Enhancement Themes are a key element of a five-part framework, which has been designed to provide an integrated approach to quality assurance and enhancement. The Enhancement Themes support learners and staff at all levels in further improving higher education in Scotland; they draw on developing innovative practice within the UK and internationally. The five elements of the framework are:

- a comprehensive programme of subject-level reviews undertaken by higher education institutions (HEIs) themselves; guidance is published by the SFC (www.sfc.ac.uk)
- enhancement-led institutional review (ELIR), run by QAA Scotland (www.qaa.ac.uk/reviews/ELIR)
- improved forms of public information about quality; guidance is provided by the SFC (www.sfc.ac.uk)
- a greater voice for students in institutional quality systems, supported by a national development service - student participation in quality scotland (sparqs) (www.sparqs.org.uk)
- a national programme of Enhancement Themes aimed at developing and sharing good practice to enhance the student learning experience, facilitated by QAA Scotland (www.enhancementthemes.ac.uk).

The topics for the Enhancement Themes are identified through consultation with the sector and implemented by steering committees whose members are drawn from the sector and the student body. The steering committees have the task of establishing a programme of development activities, which draw on national and international good practice. Publications emerging from each Theme are intended to provide important reference points for HEIs in the ongoing strategic enhancement of their teaching and learning provision. Full details of each Theme, its steering committee, the range of research and development activities as well as the outcomes are published on the Enhancement Themes website (www.enhancementthemes.ac.uk).

To further support the implementation and embedding of a quality enhancement culture within the sector - including taking forward the outcomes of the Enhancement Themes - an overarching committee, the Scottish Higher Education Enhancement Committee (SHEEC), chaired by Professor Kenneth Miller, Vice-Principal, University of Strathclyde, has the important dual role of supporting the overall approach of the Enhancement Themes, including the five-year rolling plan, as well as institutional enhancement strategies and management of quality. SHEEC, working with the individual topic-based Enhancement Themes' steering committees, will continue to provide a powerful vehicle for progressing the enhancement-led approach to quality and standards in Scottish higher education.

Norman Sharp
Director, QAA Scotland

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Foreword

This Enhancement Themes project - Research-Teaching Linkages: enhancing graduate attributes - has over the last two years asked institutions, departments, faculties, disciplines, staff and students to reflect on the intended outcomes of HE, and has examined how links between research and teaching can help develop 'research-type' graduate attributes. The 'attributes' in question are the high-level generic attributes that are necessary to allow our graduates to contribute to and thrive in a super-complex and uncertain future where the ability to question, collate, present and make judgements, quite often with limited or unknown information, is increasingly important; key attributes, it is argued, that are necessary for our graduates to contribute effectively to Scotland's civic, cultural and economic future prosperity.

The Enhancement Theme adopted a broad, inclusive definition of research to embrace practice/consultancy-led research; research of local economic significance; contributions to the work of associated research institutes or other universities; and various types of practice-based and applied research including performances, creative works and industrial or professional secondments.

The Enhancement Themes comprise one sector-wide project and nine disciplinary projects: Physical sciences; Information and mathematical sciences; Arts, humanities and social sciences; Health and social care; Business and management; Life sciences; Creative and cultural practice; Medicine, dentistry and veterinary medicine; and Engineering and the built environment. The aim of the projects was to identify, share and build on good and innovative practice in utilising research-teaching linkages to enhance the achievement of graduate attributes at the subject level. The sector-wide project comprised an ongoing discussion within and between Higher Education Institutions, involving staff and students reflecting on and exploring research-teaching linkages, how they can be structured and developed to achieve 'research-type' attributes, and how students are made aware of the nature and purpose of these in order to fully articulate and understand their achievements as graduates.

Research-Teaching Linkages: enhancing graduate attributes has provided the sector with a focus for reflection on the nature and outcomes of HE - along with the opportunity to develop a rich array of resources and supportive networks to add to the student learning experience and enable our graduates to contribute effectively to Scotland's future.

Professor Andrea Nolan
Chair, Research-Teaching Linkages: enhancing graduate attributes
Vice-Principal Learning and Teaching, University of Glasgow

1 Executive summary

The focus of this Enhancement Theme has been on how to enhance the links between discipline-based research and student learning and the development of research-type attributes on taught programmes. It has centred on how course and programme teams, disciplinary communities and institutions can best ensure that the worlds of university research support the student learning experience in ways that can enhance learner achievement of research-type 'graduate attributes'.

Barrie (2004, p 262) defines graduate attributes as being 'the skills, knowledge and abilities of university graduates, beyond disciplinary content knowledge, which are applicable to a range of contexts'. Arguably, such attributes are what makes higher education distinct from other forms or 'levels' of learning. Those attributes developed through students learning through discipline-based enquiry are implicitly central to what many academics value in higher education. Potentially, they also can be shaped to better ensure that graduates have the qualities and 'skills' to play a productive role in the Scottish economy and the wider civic society. Indeed, our work has been strongly shaped by considering how the university sector, through its curricula, can support an economically prosperous Scotland, but also a society that is culturally rich with engaged citizens.

The Steering Committee for the Research-Teaching Linkages Enhancement Theme chose to take 'a wide view and definition of what is meant by the term "research"'[1], and avoided an over-emphasis on RAE-significant research. Research, they concluded, could include: 'practice/consultancy led research, research of local economic significance, contributions to the work of associated research institutes or other universities…various types of…applied research'. These issues have been investigated by a range of commissioned studies; in particular through investigating practice and policy in nine cognate disciplinary areas:

- Health and Social Care
- Business, Management, Accountancy and Finance
- Physical Sciences
- Arts, Humanities and Social Sciences
- Medicine, Dentistry and Veterinary Medicine
- Life Sciences
- Engineering and the Built Environment
- Information and Mathematical Sciences
- Creative and Cultural Practice.[2]

They have also been looked at through investigations in institutions and discussions with institutional policy makers, and through discussions with international leaders in this area. This topic of work is one of great significance to many national systems. This is arguably because the pressures for selected universities and academic staff to produce

[1] Quoted from: www.enhancementthemes.ac.uk/themes/ResearchTeaching/overview.asp

[2] More information on all of these is available at: www.enhancementthemes.ac.uk/themes/ResearchTeaching

high-level international-level research is throwing into question the close interdependence between university research and student learning, and also because of the drive of many nations to move to a knowledge-based economy, requiring graduates to display many of the research-type attributes (for example critical understanding; an awareness of the provisional nature of knowledge; how knowledge is created, advanced and renewed; and the excitement of changing knowledge and originality and creativity in formulating, evaluating and applying evidence-based solutions and arguments) that were the focus of this Enhancement Theme.

Key findings

- There is evidence of good engagement with this Enhancement Theme across all the disciplinary communities in Scotland, and a growing recognition of the ways this Enhancement Theme connects to other quality Enhancement Themes, in particular the First Year Experience, Employability, and Assessment, and to institutional agendas.
- There is strong evidence of a wide range of examples of individual courses that have established effective ways of linking teaching and research to enhance graduate attributes. Such good practice is evident across the broad range of institutional types, is strong in final years of undergraduate study and to an extent is evident in the introductory years.
- Such good practice is clearly attuned to the particular concerns of the disciplines, but is also capable of being adapted to other contexts.
- Disciplinary programmes are working hard to ensure that the student voice and experience is central to discussions and the development of policy in this area.
- Key discipline findings can be accessed on page 20.

Areas for development

- While there are wide-ranging innovative examples of practice and policy in all institutions, much of this is implicit and not systematically developed or supported.
- While the evidence was strong of effective examples of practice at final-year level (for example, some form of research project), institutions, departments, and schools need to ensure that these research attributes are developed systematically through programmes in a structured manner from year one.
- There is a sense that the issues were better understood and supported by staff heavily engaged in teaching, and not really understood or supported by those with a major focus on research.
- Attention needs to be given to ensuring that students are aware of, and understand the importance of, research-based attributes for their future employability and success as lifelong learners. Course teams need to develop ways that support students' understanding of these attributes and their belief in how they can aid their future employment and involvement in civic life.

- On courses that contain a number of disciplinary perspectives, course teams and institutions need to consider how to support students' understanding of the disciplinary research attributes delivered across a range of programmes (Jenkins, 2009).
- Profession-based courses should build on the strong links with relevant professional bodies so as to support relevant employment-focused research attributes, which are a central feature of all programmes; and where particular issues, for example ethics and research governance, 'threaten' the full realisation of research-teaching linkages, such barriers should be minimised.
- Where there are strong disciplinary 'high level' researchers or research groups operating in the academic environment, thought needs to be given as to how that research can be effectively integrated in undergraduate programmes from year one.

Key recommendations

- Course teams, departments and schools should consider how to best develop explicitly a structured approach to developing research-type attribute across the curriculum.
- Departmental and school policies should be developed to promote systematic linking of research and teaching throughout degree programmes.
- Attention should be given to ensuring that the final-year's focus on research-based attributes is effectively underpinned by structured interventions from year one.
- Particular attention needs to be given to year-one courses that support student introduction to disciplinary and professional communities of practice and develop students' 'research mindedness'. Upon graduation (and before), students need to be able to apply this 'research mindedness' to employment and their wider roles in society.
- There is the potential, and indeed the need, to progress this agenda through the use of assessment regimes that help students in developing and articulating these research-based graduate attributes. These assessments need to be recorded in ways that support graduate employability and make more transparent to employers the research knowledge and skills students have developed in higher education.
- The Scottish Government and Universities Scotland should consider developing policy to better ensure that funded research is fed into the undergraduate curriculum in a demonstrable manner, thus supporting enhanced learning for students in higher education and promoting knowledge-exchange to key stakeholders.

The central agenda now is for course teams, departments and institutions to progress effective research-teaching linkages to support the development of research-type graduate attributes, using, where appropriate, the resources from this Enhancement Theme to further enhance their own discipline practices and policies. The next Enhancement Theme - Graduates for the 21st Century - will take forward the outputs from this one and link these with those from other recent Enhancement Themes, in particular the First Year Experience, Employability, and Assessment.

2 Introduction

2.1 Aims

The focus of the Research-Teaching Linkages Enhancement Theme has been on how to enhance the potentially positive links between discipline-based research and student learning, and the development of research-type attributes on taught programmes. It has centred on how course teams, disciplinary communities, programmes and institutions can best ensure that the worlds of university research support the student learning experience in ways that can enhance learner's achievement of research-type 'graduate attributes'. These were seen as important, both in helping them articulate what many see as the distinctive academic values of higher education, and also in assisting them to apply that knowledge, skills and values to subsequent employment and involvement in civic life.

2.2 Programme of work

The methods employed by the Enhancement Themes have, over time, developed to more direct involvement by higher education institutions (HEIs), student representatives and discipline-based staff in the Enhancement Theme's activities. The Research-Teaching Linkages Enhancement Theme was designed to achieve such involvement by formally appointing members of the Steering Committee from institutional discipline-based staff and student representatives to guide its work. Project directors supported the Enhancement Theme's progress and work in institutions and disciplines.

The primary locus of the discussions around the sector-wide dimensions of the Enhancement Theme rested within each HEI. This was supported by opportunities for cross-institutional dialogue and reflection through the vehicle of the various conferences and seminars. In parallel, there was a series of discipline-based projects and subsequent events to bring a strong discipline focus to the work. At both institutional and disciplinary level there was a strong emphasis on gathering examples of interesting practice that could be adapted by staff in other institutions. These focused on different structural levels and organisational orientation.

Another component of the methodology was the collaboration with a number of international advisors in this area of teaching and research, and in particular graduate attributes. The project directors also supported staff in the disciplinary projects to draw on the international literature.

3 The Scottish knowledge economy, civic society and research-teaching linkages

> Scotland has a long tradition of valuing learning for the wider benefits that it can bring to the individual, to society and communities and to the economy. This Government continues to support fully the view that the years we spend in education generate a form of capital that has the potential to produce a long-term return. Skills development contributes to economic development from which we believe other benefits flow such as social justice, stronger communities and more engaged citizens.
> (The Scottish Government, *Skills for Scotland: A Lifelong Skills Strategy*, 2007, p 6)

> Scottish universities develop higher level skills requiring a learning experience that is research informed and train most of the professionals who work in Scotland in science and engineering, health, education and a wide range of other fields.
> (The Joint Future Thinking Taskforce on Universities, *New Horizons: responding to the challenges of the 21st century*, 2008, p 6)

The importance of higher education students learning in a research environment is central to the values of most academics. This may not be enough to convince governments, students and taxpayers of the desirability of supporting research-linked curricula. However, the knowledge and skills, or graduate attributes, that university students can develop through learning in a research-based environment can be directly linked to the concerns of developing a 'knowledge economy' and an informed, culturally enriched and engaged civic society.

The Scottish Government (2007, p 26) has strongly affirmed that the knowledge and skills learned in higher education are important to its skills strategy and overall economic and social strategies. In its strategy document, *Skills for Scotland: A Lifelong Skills Strategy*, it argued that:

> A steady flow of graduates and technicians is vital in order that industries in which Scotland operates at the leading edge - the life sciences, the creative industries, financial services, or energy sectors such as renewables - can continue to compete favourably.

Indeed, Mark Batho, then Director of Lifelong Learning, Scottish Executive (now Chief Executive of the Scottish Funding Council) speaking at the November 2007 conference that marked the mid-term review of the Enhancement Theme affirmed that:

> …what you are discussing is absolutely aligned with the ambition of the Skills Strategy to develop people with the skills which support the demand side - our economy - is telling us are needed.

However, he also posed a series of challenges to this agenda, including: 'are we good enough at telling students what skills they are, or should be, acquiring?' and 'is the sector strong in linking and developing these research skills explicitly to the 'knowledge economy?'.[3]

The issue of ensuring that students develop high-levels skills and knowledge, and can apply them in employment and society after graduation, is also a strong theme in the UK-wide discussions on skills (the 2006 Leitch report[4]) and in European discussions prompted by the 2000 Lisbon Agreement[5]. In Scotland, the Interim Report of the Joint Future Thinking Taskforce on Universities, *New Horizons: responding to the challenges of the 21st century* (2008), put these issues at the centre of its discussions on the future of Scottish higher education. In particular, it argued that higher education and government needed to ensure 'an increasing focus on "skills utilisation" - the extent to which people not only have skills but use them to best effect' (p 8). These are not just employment and economy-focused issues. Such knowledge and skills are vital to the support and development of an engaged and culturally enriched civic society. But such linkages between university curricula and university research, and the wider culture, need to be explicitly developed and not left as tacit practice. These perspectives provide lenses through which to consider both the immediately following sections on graduate attributes, and how they are at present being developed by institutions and discipline course teams. They also strongly shape recommendations made in section 7 (page 26) for further progressing the outcomes from this Enhancement Theme.

[3] Mark Bartho's speech is available from: www.enhancementthemes.ac.uk/themes/ResearchTeaching/presentations.asp

[4] The report, *Prosperity for all in the global economy - world class skills*, can be accessed from: www.dcsf.gov.uk/furthereducation/index.cfm?fuseaction=content.view&CategoryID=21&ContentID=37

[5] Available at: www.europarl.europa.eu/summits/lis1_en.htm

4 Graduate attributes and research-teaching linkages

> …universities should treat learning as not yet wholly solved problems and hence always in research mode.
> (Humboldt 1810, cited by Elton 2005)

> Scottish universities have developed a distinctive culture in which (in accordance with the Magna Carta Universitatum 1988 to which they all subscribe) the indivisibility of teaching and research is recognised as the defining characteristic of Scottish university education which distinguishes it from all other types of education.
> (*New Horizons: responding to the challenges of the 21st century*, p 5)

In Scotland 'the number of people with degrees has risen by a half in the past two decades; one third of young people now go to university with a further one sixth studying for higher education qualifications in places such as colleges' (*New Horizons*, p 12). This is part of the international expansion of higher education and raises important questions of what makes higher education higher, to distinguish it from other levels of education and training.

Many are persuaded that what really distinguishes **higher** education is its focus on supporting **students**' understanding of how research is continually reshaping our knowledge of the world. Thus, Ron Barnett has argued that the world we live in is 'supercomplex' where not only knowledge is uncertain, but also that how we seek to understand such complexity - for example, world climatic change - is itself contested by different research approaches and the abundance of information. He then argues that the role of higher education is to help students and the wider society cope with that complexity, and that the key to this lies in teachers adopting 'teaching approaches that are likely to foster student experiences that mirror lecturers' experiences as researchers' (Barnett, 2000, p 163). Related to that, Brew (2007, p 7) has argued that 'for the students who are the professionals of the future, developing the ability to investigate problems, make judgments on the basis of sound evidence, take decisions on a rational basis, and understand what they are doing and why is vital. Research and inquiry is not just for those who choose to pursue an academic career. It is central to professional life in the twenty-first century'.

Such approaches give us an overall philosophy - but that leaves open how we should 'deliver' those overall ideals. Central to the approach taken by this Enhancement Theme has been to put **graduate attributes** at the centre of the work. Barrie (2004, p 262) defines graduate attributes as being 'the skills, knowledge and abilities of university graduates, beyond disciplinary content knowledge, which are applicable to a range of contexts'. Arguably the strength of this approach is that not only might it help us to distinguish **higher** education, but perhaps more significantly, it puts the focus on the qualities we want to develop in the **student**. In the context of this Enhancement Theme it shifts the focus away from the research-skills and knowledge of staff, to trying to identify what the central graduate abilities are that we want to develop in students, as to

their knowledge of research and the abilities developed through research. The Steering Committee, guided by the subject benchmark statements, identified a set of research graduate attributes to guide work on the Enhancement Theme.

In developing this strand of our work, we were guided by the work of Simon Barrie of the University of Sydney and related initiatives in Australian higher education (Barrie, 2004 and 2007, Bowden et al, 2000, and Jones, 2009). This work shows the potential importance of such attributes. But it also reveals that there can often be contradictory and unresolved differences in the understanding of what we mean by 'graduate attributes', ranging from 'are they discrete skills?' to 'are they different levels of what some might call "research mindedness" or understandings of knowledge complexity?'. Barrie also points to the importance of translating graduate attributes into learner-centred curricula; and in supporting staff and students in developing shared meanings of them in their particular disciplinary and institutional contexts. We will return to these issues in section 5 (page 13) as we look at the work of the institutional and disciplinary projects.

At undergraduate level

- Critical understanding
- Informed by current developments in the subject
- An awareness of the provisional nature of knowledge, how knowledge is created, advanced and renewed, and the excitement of changing knowledge
- The ability to identify and analyse problems and issues and to formulate, evaluate and apply evidence based solutions and arguments
- An ability to apply a systematic and critical assessment of complex problems and issues
- An ability to deploy techniques of analysis and enquiry
- Familiarity with advanced techniques and skills
- Originality and creativity in formulating, evaluating and applying evidence-based solutions and arguments
- An understanding of the need for a high level of ethical, social, cultural, environmental and wider professional conduct.

At Master's level

- Conceptual understanding that enables critical evaluation of current research and advanced scholarship
- Originality in the application of knowledge
- The ability to deal with complex issues and make sound judgements in the absence of complete data.

5 Revealing and enhancing disciplinary and institutional practices and policies

> We want all students to access the benefits exposure to teaching informed by research can bring.... We believe an understanding of the research process - asking the right questions in the right way; conducting experiments; and collating and evaluating information - must be a key part of any undergraduate curriculum... (Bill Rammell, UK Minister for Higher Education, 2006, p 11)

The issue of research-teaching relations is of international significance, and this is explored in section 6. In part, this is because the pressures from governments for high-level research output is arguably leading to a concentration of that research in selected internationally recognised universities, and threatening the view that universities should be where teaching and research are linked. In 2003, the UK Government argued in its White Paper, *The future of higher education*, that the evidence on research-teaching relations indicated that, while it was important for staff to be involved in 'scholarship', it was not necessary to be active in cutting edge research to be an excellent teacher, and thus one could have 'teaching-only' universities. This was a misreading of the international research evidence on research-teaching relations. The UK Government has since moved away from that perspective to, in effect, both value the graduate attributes that **student** involvement in research-based teaching can develop, and to point to the importance of the curriculum in realising those attributes (Rammell, 2006). However, that does leave open the extent to which academic staff need to be involved in research to support those attributes.

There is now an extensive international research literature on research-teaching relations (for example, Jenkins, 2004, Brew, 2006, Trowler and Wareham, 2007). In brief, that research is pointing to:

- the complexity of teaching research relations, including how they vary by discipline and institutional type
- the conflict for academic staff between teaching and research time, and the degree to which institutions reward these activities and their potential linkages
- a view often expressed by students that too often the (undergraduate) student experience is of being 'at arms length' (Brew, 2006) from the worlds of university research
- the need for explicitly planned research-teaching linkages that are supported at course team, departmental, institutional and national levels - as through the work on this Enhancement Theme.

5.1 Frameworks for conceptualising research-teaching linkages

To progress research-teaching linkages, course teams, disciplinary communities and institutions need a 'language' or framework from which to investigate and enhance current practice. Drawing on the research evidence, Griffiths (2004) and Healey (2005) have developed the widely used frameworks outlined below.

Research-led: where the curriculum is largely shaped by the research interests of staff and current research developments in the discipline(s).

Research-oriented curriculum: which emphasises teaching processes of knowledge construction and research methodologies in the discipline(s).

Research-tutored curriculum: which emphasises learning focused on students' writing and discussing papers or essays supported by academic staff.

Research-based curriculum: which emphasises students' undertaking enquiry-based or research-based learning.

These are ideal types - much teaching and course design may combine these different perspectives. But they provide a framework to consider how course teams, disciplinary communities and institutions in Scotland are shaping and enhancing research-teaching relations.

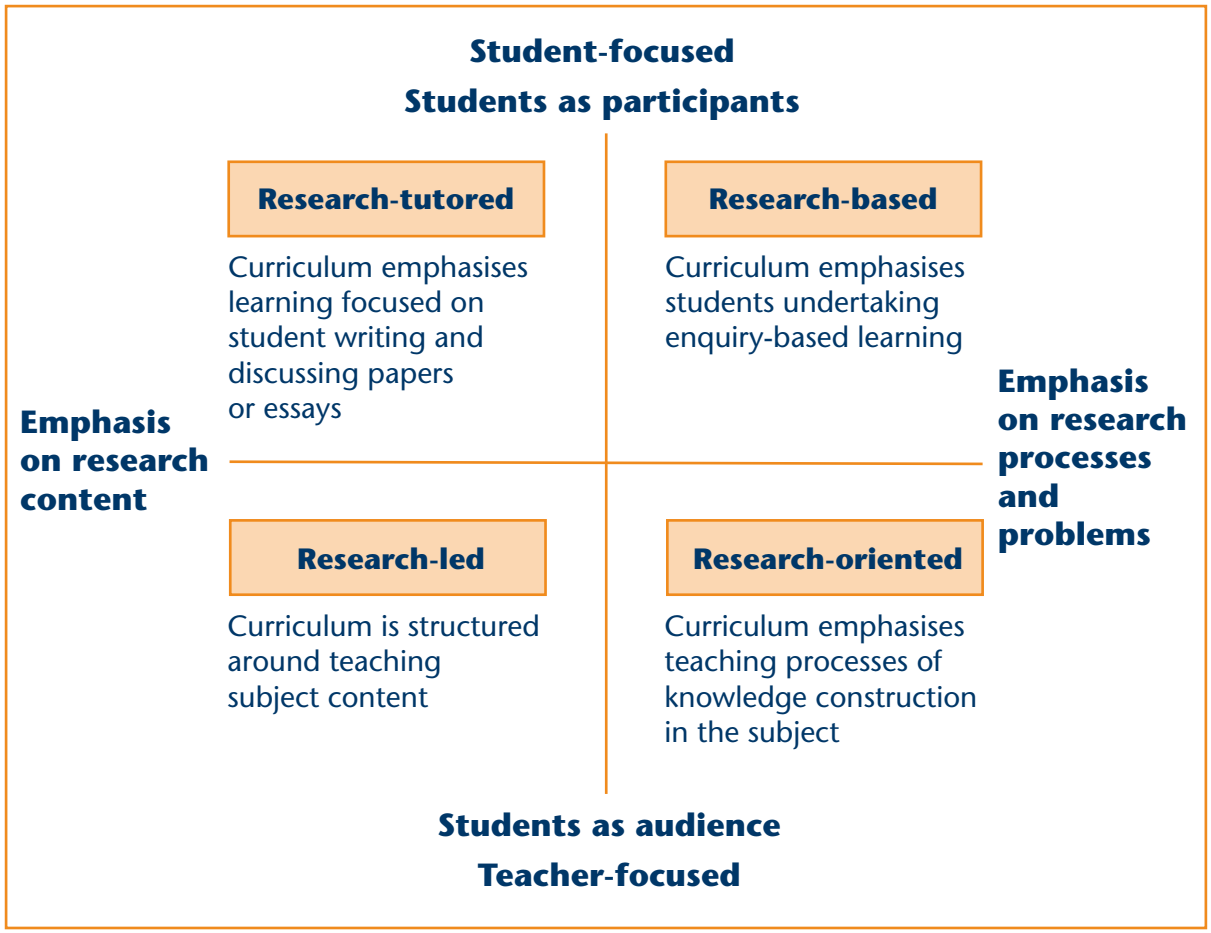

Figure 1: curriculum design and the research-teaching nexus. Source: Healey (2005, p 70)

5.2 What is research?

In progressing this agenda, we need not just a language or conceptual framework to understand 'research-teaching linkages', the term **research** is itself problematic. Thus reviewing the institutional discussions, Gordon and Land (2008, p 53) observed the variations in the interpretations of the word research within and across institutions, because 'institutions started from different strategic positions and had different objectives'.

For some staff and institutions, research can be precisely defined as for the Research Assessment Exercise (RAE) as 'original investigation undertaken in order to gain knowledge and understanding'[6]. That definition and, more critically, the procedures of the RAE do not consider its potential role in supporting teaching. However, for others, that definition ignores the complexity and the variations in the nature of research, and how these in turn may or may not relate to the university curriculum (Brew, 2001 and 2006). In the particular context of the importance of developing the knowledge economy and civic society in Scotland (see section 3, page 9), the RAE definition of research arguably both polarises teaching and research and fails to acknowledge conceptions of research and research-teaching linkages that focus on knowledge transfer and 'third stream' activities. Here, work by Gibbons et al (1994) has shown the importance of consultancy, commissioned, economy-focussed, or what is often described as 'mode 2' research; research that is central to economic growth and public policy. Furthermore, US-derived concepts of 'public scholarship' and the 'scholarship of engagement' (Boyer, 1990, Colby et al, 2003) explore how universities through their research and teaching strategies can explicitly support an informed and enriched society. Realistically, these issues will be seen differently by different institutions, departments and disciplines, but they need to be surfaced. For this Enhancement Theme, the steering committee adopted a wide view and definition of what is meant by the term 'research' and included: practice/consultancy-led research; research of local economic significance; contributions to the work of associated research institutes or other universities and various types of practice-based and applied research, including performances; creative works; and industrial or professional secondments. Gordon and Land (2008, p 53), as part of this Enhancement Theme's sector-wide report, noted the variability across institutions in defining research, and included the following:

- RAE returnable research
- practice-led research
- consultancy-based research
- research of local economic significance
- contributions to the work of associated research institutes or other universities
- various types of practice-based and applied research, including
    - performances
    - creative works
    - industrial or professional secondments
- 'research-minded' activity, including in inquiry-based learning (IBL) and problem-based learning (PBL).

[6] See: www.lse.ac.uk/collections/researchAndProjectDevelopmentDivision/temp/FAQ.htm#definitionOfResearch

5.3 Teaching-research relations in disciplinary communities and departments

Central to work on this Enhancement Theme has been a related set of discipline-based projects focused on the sharing of, and developing on, current and emerging practice at the discipline level. Some researchers see the central variations in how research-teaching relations are conceived and enacted as largely shaped by individuals' conceptions of teaching and research (Brew, 2006) and/or departmental and institutional learning and teaching regimes (Trowler and Wareham, 2007). Other analysts emphasise the way research-teaching relations are shaped by disciplinary and multidisciplinary cultures and practices (Jenkins, Healey and Zetter, 2007).

The importance of the disciplinary approach is in part tactical - many staff have strong allegiances to their disciplinary community and are probably more likely to adopt practices from that community. Also, disciplinary communities vary in how they conceive what research is, the effective forms of teaching, and, for some, their practices are strongly shaped by professional bodies. More significantly to our focus on student graduate attributes, there is growing evidence as to how the student experience of research, and the attributes they develop, are shaped by the disciplines they study. For example, a study of student experiences of research at the University of Canterbury in Christchurch, New Zealand, revealed significant disciplinary forces shaping the student experience of research. Students studying physics saw the importance of research to the discipline, but were clear that such research was beyond their experience and their 'capabilities', while students studying English experienced research as something that was part of both the content of the curriculum and the pedagogy of their discipline. Thus, evidence from a range of sources indicates the importance of the discipline-based approach that has been central to work in this Enhancement Theme.

	Physics	**Geography**	**English**
What is research?	Breaking new ground; moving forward; exploration and discovery	Gathering information in the world; answering a question	Looking into; gathering; putting it together; a focus of interest
How visible is it?	Laboratories and machinery (ie tools) but often behind closed doors	Most visible in the field	Not tangibly visible but apparent in the dialogue
Where is it located?	Out there; at a higher level	Out there in the field	In the library; in the head
Who does it?	Lecturers	Lecturers and (increasingly over time) students	Lecturers and students

Table 1: students' experiences of learning in a research environment

Source: Drawn from Robertson and Blackler (2006). Based on interviews with 36 students (first years to postgraduates) at the University of Canterbury, New Zealand.

The disciplinary strand of the Enhancement Theme was organised around nine cognate areas led by staff in those disciplines. The work is ongoing within these disciplinary communities.

The disciplinary strands in the Research-Teaching Linkages Enhancement Theme are:

- Health and Social Care
- Business, Management, Accountancy and Finance
- Physical Sciences
- Arts, Humanities and Social Sciences
- Medicine, Dentistry and Veterinary Medicine
- Life Sciences
- Engineering and the Built Environment
- Information and Mathematical Sciences
- Creative and Cultural Practice.

Project teams reviewed the relevant international literature and worked with staff and students in these discipline communities across Scotland, both in department visits and meetings and in wider national discussions. This work has revealed a rich array of discipline-based case studies of practice that provide strong evidence of the extent of good practice across the sector and a rich set of resources for supporting disciplinary communities and institutions in future enhancement work. This work has also developed our understanding of research-teaching relations, how these develop research-based attributes in graduates of different disciplines, and how that can be further enhanced.

In the following sections, summary outcomes from the disciplinary projects are highlighted. These bring out particular issues as seen from within these discipline groups; but some aspects may also reveal cross-disciplinary issues. All the disciplinary work was informed by the work of the Quality Assurance Agency for Higher Education's (QAA) subject benchmark statements[7], and many drew explicitly on the work of the Higher Education Academy Subject Centres, many of which have had projects or initiatives about linking teaching and research[8]. In reading the disciplinary analyses below, please do note that they are but brief highlights from the full disciplinary reports and will hopefully lead you to read these in full (available at **www.enhancementthemes.ac.uk/themes/ResearchTeaching**. For each strand, two or three key distinctive features are highlighted.

Life Sciences

- It is important to stimulate a sense of enquiry in students through innovative problem-solving and field-based learning in the early years of programmes, and to foster a questioning attitude throughout the student learning experience.
- Involve students in designing, constructing and interpreting their own experiments, including use of inherited protocols from previous cohorts, to reinforce value of independent learning.

[7] Available at: www.qaa.ac.uk/academicinfrastructure/benchmark

[8] See: www.heacademy.ac.uk/ourwork/research/teaching/disciplines

- Increase immersion of students in research environments through competitive internships during pre-final year summer vacation in preparation for capstone project experience.

Health and Social Care

- Students clearly recognise the importance of developing 'professional' skills and may not immediately appreciate the value of a curriculum focus on research-based attributes.
- External professional and registration bodies significantly shape the curriculum in these disciplines.
- Programmes are finding it difficult to maintain an enquiry-based final year dissertation. This is because obtaining ethical approval is difficult and complex.

Business, Management, Accountancy and Finance (BMAF)

- In BMAF disciplines, the link between teaching and research lies in the programmes' focus on high-level graduate employability. This focus leads to curricula based around research that can enhance current and future practice by graduates from these disciplines, and also on ensuring graduates have the skills to interpret and undertake applied research.
- At undergraduate level, there is a strong curricula focus on applied research. At postgraduate level, there is a distinction between applied programmes aimed at the development of practising managers and those designed with a primarily academic focus to develop future academics.
- There are important sub-disciplinary differences between business and management curricula, and accountancy and finance curricula. Accountancy and finance have a clear professional focus. Those on business and management vary - often between institutions - between those that take a disciplinary-based approach to the early stages of study, and those that take a more applied approach throughout the curriculum.

Physical Sciences

- There is increasing recognition of the importance of introducing research in year one; there are more programmes providing a strong introduction to research practice to large year-one introductory courses, for example, lab guides written as experiments to be conducted rather than recipes to be faithfully followed. Other innovations have necessitated large-scale investments in year one programmes.
- Most departments have a final-year 'capstone' research project. For some departments, producing work of a quality suitable for publication is a stated goal of the project.
- Evidence suggests that recent graduates recognise and value the ways in which the curriculum embeds and supports training in, and acquisition of, research-type skills.

Arts, Humanities and Social Sciences

- These disciplines are not tightly bounded subjects. Rather, programmes often demonstrate contrasting research approaches and methodologies. Arguably, one of the strengths of the arts, humanities and social sciences is the potential to expose students to diverse styles, approaches and ways of being and thinking.
- To do justice to the potential for effective research-teaching linkages in these disciplines, it is important to explore the demand and interaction with the more general culture. This relationship with public cultures may be the most unifying aspect of the arts, humanities and social sciences, especially in light of the debates concerning both the justification of their study and the influence they might or might not have on graduate attributes.

Medicine, Dentistry and Veterinary Medicine

- As research is continually reshaping the evidence base for these subjects, curricula need to be continually redrawn to keep pace with the research.
- However, given the professional/practical orientation of students in these disciplines, the value of such a research-informed approach needs to be explicitly explored with students, because their immediate orientation is to their future professional practice. While a final-year undergraduate research project is clearly important for those students intent on an academic career, it is less clear whether this is important for those students focused on professional practice.
- The role of professional bodies clearly shapes the role of research in these programmes. In this respect, there appeared to be clear differences between medicine, and dentistry and veterinary medicine. In medicine, the General Medical Council's report *Tomorrow's doctors* (2003) had freed up space in the curriculum, which can be used to engender a research ethos. In dentistry and veterinary medicine, the focus of the professional bodies appears currently to be more on clinical competencies and current knowledge base.

Engineering and the Built Environment

- Much staff research in these disciplines is applied research and consultancy. This 'knowledge economy' emphasis is also strongly apparent in how student experience research in curricula in programmes in these disciplines. In architecture, this practical focus is arguably more evident, but there the pedagogic focus may bring students close to the research-based professional practice of academic staff.
- Students' focus on entering professional practice-based careers brings a strong employment focus to the culture of these courses. While readily appreciating the importance of consultancy-style research, special curricula emphasis may be needed to bring out the importance to them of more traditional research.
- As with health and social care, professional bodies significantly shape the curricula in these programmes. They tend to put more emphasis on the skills and aptitudes for using the findings of research than on the expertise to conduct research. However, research and research-type activities are becoming more evident in the accreditation criteria for courses at both undergraduate and postgraduate levels.

Information and Mathematical Sciences

- The key benefit of linking research and teaching is to enthuse a future generation about the excitement of exploration; understanding the research process itself is as important as comprehending the detail of the discipline's current cutting-edge research, which may be either too dynamic to keep up with, or too cumulative in nature.
- It is important to demystify research at an early stage, and this can be done through exposure from day one to what excites teachers about their research. Direct student participation in research projects is most common at final-year undergraduate and taught post-graduate levels. It is particularly appropriate to applied subjects.
- Students are particularly excited by research which they can relate to an application or real-world problem. It can be inspirational or aspirational for some, with less tangible, but still valuable, benefits to others, even where it is not directly motivating for all students.

Creative and Cultural Practice

- Academics in these disciplines vigorously debate the meaning and role of 'research' in the arts - in particular, whether and how arts practice and performance can be considered as 'research'. These debates are also reflected in students' perceptions of the role of research in their courses, and in the tension between the 'professional' and the 'academic' that can exist for students, academics and institutions.
- Teaching in these disciplines often involves students and teachers working together to create and discuss new artworks and performances. Exploring and explicating the complex processes involved in these activities offers rich opportunities for strong and creative research-teaching linkages in such courses. Undergraduate final-year research projects in these disciplines often focus on students producing new knowledge in the form of artwork, performance and creative works, and reflecting on their processes. Other, more conventional, forms of research, such as the independently-researched dissertation, often form a compliment to such projects.

The overall disciplinary picture - key findings

- Across all disciplines there is evidence of strong engagement with this Enhancement Theme and rich evidence of a wide range of examples of individual courses that have established effective ways of linking teaching and research.
- Such good practice is evident across the broad range of institutional types, is strong in final years of undergraduate courses, and, to an extent, is evident in the introductory years.
- Such good practice is clearly attuned to the particular concerns of the disciplines, but is also capable of being adapted to other contexts.
- Disciplinary programmes are working hard to ensure that the student voice and experience is central to discussions and the development of policy in this area.

5.4 Areas for enhancement by disciplinary course teams

- While there are innovative examples of practice and policy in many course teams and departments, much of this is implicit and generally not systematically developed or supported. Course teams and departments should consider how to best develop this tacit practice in ways that do not stifle effective practice, but ensure it is both supported and integrated into coherent course structures and departmental policies.
- Much more attention needs to be given to ensuring that the final-year focus on honours research-based attributes is effectively underpinned by structured interventions from year one. Perhaps particular attention needs to be given to year one courses that support student introduction to disciplinary and professional communities of practice.
- More explicit attention needs to focus on ensuring that effective research-teaching linkages are developed progressively and coherently vertically across the years of the undergraduate programme.
- Far more attention needs to be given to ensuring that students understand the importance of the research-based attributes that at present are often implicit to their understanding of their courses. Students need to be supported in realising how these attributes are being developed through their curricula and how they are taught, learnt and assessed. It is not simply a question of stating them in course documents; course teams need to experiment with ways that support students' understanding of these attributes and how they can aid students' future employment and involvement in civic life.
- On courses that contain a number of disciplinary perspectives, course teams and institutions need to consider how to support students' understanding of the disciplinary research attributes delivered across a range of programmes (Jenkins, 2009).
- Professional-based courses should build on the strong links with relevant professional bodies so that relevant employment-focused research attributes are a central feature of all programmes. Where particular issues, for example ethics/research governance, 'threaten' the full realisation of research-teaching linkages, such barriers should be minimised.
- Where there are strong disciplinary 'high level' researchers or research groups operating in the academic environment, thought needs to be given as to how that research can be effectively integrated in undergraduate programmes from year one.

6 Developments outside Scotland

> The New Zealand Education Amendment Act of 1990, identified five characteristics of a University, including that at universities 'research and teaching are closely interdependent and most of their teaching is done by people who are active in advancing knowledge.' The Act also states that a 'degree' is a qualification awarded following a course of advanced learning, that is taught mainly by people engaged in research.
> (Woodhouse, 1998, p 4)

Many national systems, and QAA Scotland through this Enhancement Theme, are now looking to the work of Scottish institutions for providing a particularly distinctive and effective approach in developing research-teaching linkages through the focus on graduate attributes.

Internationally, there are a range of initiatives to bring teaching and research more effectively in synergy (Healey and Jenkins, 2007). National projects provide resources that Scottish institutions and disciplinary communities can adapt, and some of these initiatives may be helpful in shaping future policies, practices and funding in Scotland. For example, the above quotation is a statement by David Woodhouse, founding Director of the New Zealand Universities Academic Audit Unit. In 2000-2001, under his leadership, the Unit audited all New Zealand universities for the extent to which they linked and enhanced research-teaching linkages at undergraduate and postgraduate levels (Jenkins et al, 2003). This Enhancement Theme has been heavily shaped by research on graduate attributes in Australia led by Simon Barrie (2004, 2007) from the University of Sydney.

The Australian Learning and Teaching Council funded a scoping project in 2007-08, led by the University of Sydney, to 'investigate institutional strategies and institutional policy issues related to embedding and assessing graduate attributes'[9].

The goals for this project are to:

- describe different approaches taken in Australian universities in embedding and assessing students' generic graduate attributes
- assess the impact of different conceptualisations of generic graduate attributes and the policy environment on the approaches taken
- identify possible barriers and affordances that impact on universities' approaches to embedding and assessing generic graduate attributes
- make recommendations that will inform universities' strategies for embedding and assessing generic graduate attributes
- make recommendations for future research and development projects relating to generic graduate attributes.

[9] See: www.itl.usyd.edu.au/projects/nationalgap/introduction.htm

The Australian Learning and Teaching Council also funded in 2007-08 a national project, 'The Teaching Research Nexus: A guide for academics and policy makers in higher education'[10]. This gathered and disseminated effective disciplinary and institutional practices and strategies to link teaching and discipline-based research. The approach of this project was somewhat similar to work on this Enhancement Theme, as it gathered, made more explicit, and disseminated good practice across institutions, disciplines and departments. These Australian resources are now available to support institutions and disciplinary communities in Scotland to further enhance research-based graduate attributes.

Some national systems have gone much further to actually explicitly fund institutions and disciplinary communities to support research-teaching linkages. Targeted funding can be particularly important to progressing key, and perhaps difficult, agendas. Arguably, effective research-teaching linkages is one of the agendas that is particularly and immediately relevant and in need of targeted funding. Examples of national systems that developed such targeted funding include the following.

6.1 United States of America

The US has a diverse system, both in terms of funding and in terms of institutional type. There has been strong public criticism of research universities for not valuing teaching and for failing to ensure that undergraduates benefit from university research. The influential Boyer Commission (1998, p 3) argued that 'the research universities have often failed, and continue to fail, their undergraduate populations, thousands of students graduate without seeing the world-famous professors or tasting genuine research'. There have been a range of initiatives by a range of US institutions and national funders to more effectively bring students into the worlds of research.

Many institutions are trying to ensure that all or many students have two of more 'high impact activities' during their undergraduate degree. These are activities which research indicates have strong impacts on retention and intellectual development. (Kuh, 2008). Many of these initiatives are what we in the UK would identify as supporting effective research-teaching linkages. These include first-year courses which focus on exploring discipline-based academic practice and are taught by a full-time academic in small classes; courses with a strong academic, but community-engagement focus; and undergraduate research programmes where students learn with strong faculty guidance in ways that are close to the faculty experience of research. This research is pointing to departments and institutions 'making it possible for every student to participate in at least two high impact activities during his or her undergraduate program, one in the first year and one later in relation to the major field' (Kuh, 2008, p 19).

Undergraduate research programmes are a growing feature of many US institutions, from the research intensives such as Massachusetts Institute of Technology to the higher education programmes in community colleges (Kinkead, 2003, Jenkins, 2008b). Two of the big research funders, the National Science Foundation (NSF) and the Howard Hughes Medical Institute, are significant funders of undergraduate research programmes. Indeed, the NSF, as well as targeting these programmes to high ability students in the sciences, has also targeted support to undergraduate research in community colleges and those targeting minority students. In addition, the NSF recently totally reshaped

[10] See: www.trnexus.edu.au

their research grants procedures to require that funded research was disseminated and integrated with the wider community, including undergraduates.

6.2 England

The Higher Education Funding Council for England (HEFCE) recently funded two major initiatives directly relevant to this agenda. In particular, responding to the reaction against the idea of 'teaching-only universities' in 2006 (see section 4, page 11), £40 million was allocated over three years to fund 'research-informed teaching' (RIT), allocated in inverse proportion to an institution's research funding. Institutions could, in negotiation with HEFCE, spend that money on:

- keeping the curriculum up-to-date and active, effectively supported by appropriate learning resources linked to recent research
- enabling staff to engage with developments in their field and link to developments in their teaching
- ensuring that courses are designed in ways that support the development of learning outcomes appropriate to the knowledge economy, including appropriate pedagogy - that is, students experiencing research and developing research skills
- embedding research-informed teaching in institutional structures, including human resources strategies and quality assurance processes.

In addition, of the 74 Centres for Excellence in Teaching and Learning (CETLs), five are focused on enquiry and research-based learning. Each CETL received up to £2.35 million capital and £0.5 million recurrent expenditure per year for five years.

Those centrally focused on research-teaching linkages are:

1 University of Gloucestershire, the Centre for Active Learning (www.glos.ac.uk/ceal)

2 University of Manchester, Centre for Excellence in Enquiry-Based Learning (www.manchester.ac.uk/ceebl)

3 University of Oxford, Centre for Excellence in Preparing for Academic Practice (www.learning.ox.ac.uk/cetl.php?page=54)

4 University of Reading, Centre for Excellence in Applied Undergraduate Research Skills (www.rdg.ac.uk/cetl-aurs)

5 University of Sheffield, Centre for Inquiry-based Learning in the Arts and Social Sciences (CILASS) (www.shef.ac.uk/cilass)

6 University of Surrey, Surrey Centre for Excellence in Professional Training and Education (SCEPTrE) (www.surrey.ac.uk/sceptre)

7 Universities of Warwick and Oxford Brookes, The Reinvention Centre for Undergraduate Research (www2.warwick.ac.uk/fac/soc/sociology/research/cetl).

The work of these seven CETLs is of significance to this Enhancement Theme in a number of ways. English institutions had some considerable freedom in where to focus their bids for CETL funding. The fact that seven of the 74 focused on the agenda of this Enhancement Theme further indicates its significance to institutions and disciplinary communities. In addition, these CETLs received significant funding and were encouraged

to experiment. The publically available web resources and some of the innovations - such as the development of US-style undergraduate research programmes at Gloucestershire, Reading, Warwick and Oxford Brookes - may well provide ideas for Scottish institutions and departments for further progressing this agenda (Healey and Jenkins, forthcoming).

6.3 Republic of Ireland

The Irish Government, in its attempt to support economic and social growth, recently invested heavily in developing research capacity through the Programme for Research in Third-Level Institutions (PRTLI)[11]. PRTLI provides integrated financial support for institutional strategies, programmes and infrastructure in key areas of research spread across all disciplines. Launched in 1998, four such funding initiatives have been made to date. While the main emphasis of funding is developing research capacity - through capital funding, academic appointments, and so on - there is an explicit commitment to supporting research-teaching linkages. Applicant institutions are required to demonstrate a sustainable strategic and planned approach to the long-term development of their teaching and knowledge transfer capabilities. An implementation plan for future research-teaching linkages is required and site visits are conducted by international peer reviewers.

The Strategic Initiatives Fund has created the National Academy for the Integration of Research & Learning & Teaching (NAIRTL) to support effective research-teaching linkages across the sector[12].

[11] See: www.hea.ie/en/node/119

[12] See: www.nairtl.ie/

7 Further progressing the enhancement of graduate attributes through research-teaching linkages in Scotland

> As the outcomes from the Research-Teaching Linkages Enhancement Theme accumulate, it is becoming apparent that the gains sought in relation to the First-Year Experience Enhancement Theme could in part be addressed by wider adoption of some more explicit research-teaching linkages
> (Land and Gordon, 2008a, p 62)

> How will we know we've been successful?...where the interaction between academics and policy makers in the Scottish Government has improved to such an extent that academic work feeds in more regularly and more influentially into the policy process thereby improving the quality of public policy and public services in Scotland...where learning, teaching and research continue to be the cornerstone of university activity and are increasingly carried out as collaborative activity across these boundaries....
> (*New Horizons: responding to the challenges of the 21st century*, p 10)[13]

The issues this Enhancement Theme have analysed and sought to enhance are at the centre of university life. While the work on this Enhancement Theme has significantly moved practice and policy forward, it has also revealed much that now needs to be further progressed. In conclusion, we focus on how this agenda can be further enhanced. Centrally, this needs to be by course teams, departments and institutions as part of their ongoing work. The next Enhancement Theme will further progress this agenda by supporting **institutions** to develop initiatives or projects that link with previous Enhancement Themes - including the First Year Experience, Employability, and Assessment - with an overall integrated focus on what the attributes should be of a graduate from Scottish Higher Education in the 21st century and how the achievement of these attributes can best be supported. The Higher Education Academy could support this work inside institutions, in particular by working with disciplinary communities in Scotland. The Scottish Government and Universities Scotland could develop initiatives that better ensure that university curricula and research are more effectively deployed and integrated to support the Scottish economy and civic life.

The central agenda now is for course teams, departments and institutions to progress research-teaching linkages, using, where appropriate, the resources from this Enhancement Theme, to further enhance their own practices and policies. The way they progress this agenda and the issues they choose to focus on will be particular to their own contexts. This is clearly a large agenda, and institutions and departments will have to be selective in where to intervene.

[13] Available at: www.scotland.gov.uk/Resource/Doc/82254/0061979.pdf

The next Enhancement Theme - Graduates for the 21st Century: Integrating the Enhancement Themes - will further support such institutional initiatives. This will be through supporting institutions in developing projects that build on and integrate the work of previous Enhancement Themes - including Research-Teaching Linkages - and link these different Enhancement Themes into projects that meet the particular needs of institutions, but with an overall focus on 'enhancing graduate attributes'. Research-Teaching Linkages: enhancing graduate attributes offers opportunities for institutions to link that agenda to many, or perhaps all, of the other Enhancement Themes; in particular the First Year Experience, Employability, and Assessment.

For example, with respect to potential linkages, many institutions and departments have a strong emphasis on students doing some form of research project in their final years. What is less evident is ensuring that in year one, students are inducted and supported in developing their understanding of,and abilities in, doing research and in developing 'research mindedness' early in their undergraduate studies. While there is undoubtedly good practice in this area, as identified in the disciplinary and sector-wide reports, it needs surfacing and supporting in structured ways across institutions and disciplinary communities. Indeed, work on the First Year Experience Enhancement Theme (Mayes, 2008) has already started drawing potential links with the Research-Teaching Linkages Enhancement Theme, for example in the work on engendering scholarship in students through explicit attention to academic writing in year one (Alston et al, 2008). There is here the potential to link this work to related work in Australia, the United States and elsewhere - including the relevant Centres for Excellence in England. Thus, Kerri-Lee Krause from Griffith University in Brisbane, and advisor to the First Year Experience Enhancement Theme, argues that:

> The principles of the teaching-research nexus should inform curriculum development and delivery from the first year as a way of promoting a sense of belonging to a community of scholars with a focus on discovery and creation of knowledge...there is much to be learned and gained from students engaging in the community - both their immediate university learning community, and the broader community - from their first year.
> (*On Being Strategic About The First Year,* 2006, pp 6, 8)

The potential for institutions to develop projects with links to the Integrative assessment Enhancement Theme is also strong. Upon graduation (and before) students need to be able to apply this 'research mindedness' to employment and their wider roles in society. Here, there is the potential, and indeed the need, to progress this agenda through increasing focus on the assessment of research-type graduate attributes at all levels of the curriculum, through linked interventions and projects that support students in articulating the research attributes they have developed through the curriculum, and applying these research-based graduate attributes. Institutions, departments and course teams need to ensure that assessment is recorded in ways that support graduate employability and make more transparent to employers the research knowledge and skills students have developed in higher education. This was one of the challenges Mark Batho posed the sector and this Enhancement Theme at the Research-Teaching Linkages: Enhancing Graduate Attributes Mid-Theme review and progress event in 2007. In some institutions, this may be through personal development planning or links with employers. Other institutions and disciplinary communities may want such developments more clearly articulated through disciplinary assessment regimes.

Staff and students need to consider how assessment of 'research mindedness' can be developed and achieved in work-placed education - for that is where much of the growth in higher education is likely to occur. The university system probably needs to develop and evaluate a range of initiatives in this key area of developing assessment of 'research mindedness' in and through employment. For this is where we can centrally address the needs of the Scottish economy and society for students who can apply these research-based graduate attributes to benefit the national society.

It is also timely to review how national research and any 'third stream' funding could explicitly support research-type attributes in our graduates; and how it can help develop undergraduates and postgraduates who have the research knowledge and skills to contribute to the development of sustainable economic growth and contribute to a healthier, smarter, fairer Scottish civic society. Scotland, through various research-pooling initiatives has gone some way to ensuring a more collaborative approach to research than the rest of the UK, but as yet many such initiatives appear to be structurally separate from university curricula. The work of the National Science Foundation in the USA, the Irish PLRTI initiative, the English 'research-informed teaching initiative' and Centres for Excellence may offer ideas to adapt to Scotland. One can envisage a range of potential initiatives that, while ensuring 'international level' research is further developed in Scotland, is also fed in to development of the higher education curricula, which develop students to graduate with research skills and mindedness and the abilities to apply that research to enhance employment and civic life in Scotland.

This is an important and exciting agenda. Work on this Enhancement Theme has identified a wide range of useful and innovative practice across Scotland. Furthermore, higher education institutions and disciplinary communities have engaged strongly with this Enhancement Theme as it resonates with their core values. Strong actual and potential links have been identified with other Enhancement Themes and university agendas and the new integrative Enhancement Theme - Graduates for the 21st Century - offers the sector an exciting and innovative way of taking forward key recommendations arising from the Research-Teaching Linkages Enhancement Theme and agenda.

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9 Useful websites

Council On Undergraduate Research (CUR)
www.cur.org

Higher Education Academy Research and Teaching
www.heacademy.ac.uk/ourwork/research/teaching

Learning Through Enquiry Alliance
www.ltea.ac.uk

The Reinvention Center at the University of Miami
www.reinventioncenter.miami.edu

Research Skill Development for curriculum design and assessment
www.adelaide.edu.au/clpd/rsd

The Scottish Higher Education Enhancement Committee (SHEEC) Enhancement Themes: Research-Teaching Linkages
www.enhancementthemes.ac.uk/themes/ResearchTeaching

The Teaching-Research Nexus: A guide for academics and policy-makers in higher education
www.trnexus.edu.au

University of Gloucestershire:
National Teacher Fellowship Scheme Project 'Leading, promoting and supporting undergraduate research in the new university sector'
http://resources.glos.ac.uk/tli/prsi/current/ugresearch/index.cfm
and
Centre for Active Learning Undergraduate Research case studies
http://resources.glos.ac.uk/ceal/resources/casestudiesactivelearning/undergraduate/index.cfm

Universities of Warwick and Oxford Brookes, The Reinvention Centre for Undergraduate Research
www2.warwick.ac.uk/fac/soc/sociology/rsw/undergrad/cetl

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QAA Scotland
183 St Vincent Street
Glasgow
G2 5QD

Tel 0141 572 3420
Fax 0141 572 3421
Email comms@qaa.ac.uk
Web www.qaa.ac.uk

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