

Institutional strategies to link teaching and research

Alan Jenkins and Mick Healey



“Institutional strategies to link teaching and research provides a comprehensive, evidence-based introduction to the ways in which institutions can and should act systematically to integrate staff research and scholarship with student learning. The publication can be strongly recommended to all those in institutions who are concerned about this critical issue.”

Professor Roger Brown, Vice-Chancellor of Southampton Solent University and Chair of the Higher Education Academy’s Research and Teaching Forum

“While research endeavour and teaching endeavour are believed to be conceptually related in higher education, that relationship needs active management and explicit support since the pressures to split the two apart are powerful. This booklet draws on the existing research evidence and practice to provide an immensely helpful guide for managing this relationship at institutional level. HE managers will find stimulating examples from a wide range of institutions in the UK, Australia, Canada, New Zealand, US and elsewhere on specific initiatives to develop the beneficial aspects of the links between the two.”

Professor Madeleine Atkins, Vice-Chancellor of Coventry University and member of the Research Forum established by the Government to advise on the relationship between research and teaching in institutions of higher education.

Acknowledgments

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All the Internet links were live in September 2005. The quickest way to access the variety of sites is to use the online version of this booklet at www.heacademy.ac.uk/resources.asp.

Foreword

The relationship between teaching and research in the modern university is one of international concern. This concern is reflected in the United Kingdom. As Jenkins and Healey rightly point out, there is little evidence to support an intrinsic relationship between teaching and research. Both research-intensive and teaching-intensive universities need to set out to consciously create a meaningful relationship within their institutions.

The authors are international authorities on the issues addressed in this publication. The publication itself succinctly summarises the research and provides a very comprehensive account of international and national efforts by institutions to constitute the relationship better within their policies and practices.

The publication is an invaluable source of ideas, references, web-links and descriptions of good practice for institutions wishing to develop the relationship further. The issue is one with which the Higher Education Academy is engaging, and this publication represents a key component of that engagement.

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Contents

| | |
|--|-----------|
| 1. Introduction | 6 |
| 2. Changes in the UK and elsewhere: teaching ‘only’ and research-intensive institutions | 9 |
| Related developments in Australia and New Zealand | 10 |
| Research evidence to guide policy: a misinterpretation of the evidence | 11 |
| 3. Research on teaching-research relations in institutions | 14 |
| How teaching and research are conceived and related in institutional policies .. | 14 |
| How students and academic staff experience teaching-research relations | 15 |
| How reward systems support or hinder staff in bringing teaching and research together | 18 |
| 4. Conceptions and definitions of teaching-research links | 20 |
| A developing framework | 20 |
| 5. Institutional strategies to link teaching and research | 23 |
| Developing institutional awareness and institutional mission | 25 |
| Strategy 1: State that linking teaching and research is central to the institutional mission and formulate strategies and plans to support the nexus | 25 |
| Strategy 2: Make it <i>the</i> mission and deliver it | 25 |
| Strategy 3: Organise events, research studies and publications to raise institutional awareness | 26 |
| Strategy 4: Develop institutional conceptions and strategies to effect teaching-research links | 27 |
| Strategy 5: Explain and involve students and parents in your institutional conception of teaching-research relations | 29 |
| Developing pedagogy and curricula to support the nexus | 30 |

| | |
|---|-----------|
| Strategy 6: Develop and audit teaching policies and practices and implement strategies to strengthen the teaching-research nexus | 30 |
| Strategy 7: Use strategic and operational planning and institutional audit to strengthen the nexus | 32 |
| Strategy 8: Develop curriculum requirements | 33 |
| Strategy 9: Review the timetable | 35 |
| Strategy 10: Develop special programmes and structures. | 35 |
| Developing research policies and strategies to strengthen the nexus | 39 |
| Strategy 11: Develop and audit research policies and implement strategies to strengthen the teaching-research nexus | 39 |
| Strategy 12: Ensure links between research centres and the curriculum and between student learning and staff scholarship | 40 |
| Developing staff and university structures to support the nexus | 41 |
| Strategy 13: Ensure the nexus is central to policies on inducting and developing new staff and to strategies to support the professional development of established staff | 41 |
| Strategy 14: Ensure teaching-research links are central to policies on promotion and reward | 44 |
| Strategy 15: Ensure effective synergies between units, committees and structures for teaching and research | 45 |
| Strategy 16: Link with related university strategies | 46 |
| Strategy 17: Participate in national programmes | 47 |
| Strategy 18: Support implementation at department level | 48 |
| Other strategies you consider appropriate | 49 |
| 6. In conclusion: back to the future. | 50 |
| Authors' biographies. | 54 |
| References | 56 |

I. Introduction

“In view of the central nature of research and teaching in HE, and the almost universal assumption that R benefits T, and the importance of scholarship, it is perhaps surprising how relatively few institutions have specific policies in place to either monitor, or to develop and maximise these beneficial synergies.” (J M Consulting, 2000, p.16)

“Academic leaders and managers need to understand the conditions likely to facilitate links between research, (staff and student) learning and teaching and those that inhibit connections and seek to compartmentalise academic activities.” (Locke, 2004, p.108)

This publication seeks to support institutional policy-makers to enable their institutions to link teaching and discipline-based research more effectively. Our focus is on supporting the relationships between student learning and staff discipline-based research in institutional policies and practices: what has variously been called the ‘teaching-research nexus’, ‘research-led’, ‘research-based’, ‘inquiry-based’ or ‘research-informed’ teaching. Our focus is not on ensuring that the institution ensures that pedagogic research is supported and used to shape institutional practice and policy, though we do believe that should be the case. With respect to the work of the Higher Education Academy we seek to support its strategic aim of ‘working with institutions in their strategies for improving the student learning experience’ (Higher Education Academy, 2005a) and to ensure that the advice is based on research evidence.

The core of the booklet is section 5 where we present an analytical framework and an international array of case studies to support effective teaching-research links in institutions. We start from the assumption that such links are core characteristics of a university education. Readers who wish to explore the arguments and complexity of these issues further may refer to the growing number of texts in this area (Barnett, 2005; Boyer, 1990; Brew, 2001; Jenkins *et al.*, 2003). We also recognise that the meaning of the terms ‘research’, ‘scholarship’ and ‘teaching and learning’ are contentious (see, for example, Brew, 2001; Elton, 2005; Healey, 2005a). Our position is as follows:

- Ultimately the central issue that national systems and institutions have to decide is: “What is distinctive about *higher* education?”
- For us, what is distinctive about higher education is supporting students and the wider society’s understanding of the complexities of the worlds in which we live.
- For many staff, their motivations and their sense of their role is highly shaped

by both their own appreciation of, and belief in, the value of research to student learning and the wider society.

- While there is evidently much good practice in realising these values, we also have to recognise that it is unevenly distributed, much is implicit and many institutional policies in this area are poorly developed and sometimes work against the nexus.
- The potential value of discipline-based research to student learning has to be set in the context of the considerable history of research evidence that questions that close relationship, particularly at undergraduate level.
- More recent research demonstrates the potential value of staff research to student learning, and for motivating students to learn. This research also shows that the linkage is not automatic, and has to be built systematically into the curriculum, department, institutional and national planning.
- Questioning the value or possibility of the link also stems from the realities of mass higher education. Thus the linkage might once have been readily assumed or delivered with small classes, selective student entry, and staff with time to teach and research effectively. Clearly if that 'golden age' ever existed, it has now gone.
- While most national systems prioritise the importance of research to supporting economic growth, that can result in governments and some institutional leaders arguing that research needs to be highly concentrated in particular universities, and even arguing the value of 'teaching-only' universities. This is a theme we will explore further in section 2. Here we simply note the issue and also recognise that without a massive rise in funding for higher education, realistically research will be differentially funded between and within institutions.
- While we recognise that there needs to be diversity in the foci and priorities of institutions, and realistically there are major variations in the capacities of institutions to deliver 'research-linked' or 'research-based' teaching, we do see an understanding and valuing of research, and to an extent the development of skills of doing research, as being central to what *all* students should experience in higher education. Indeed many aspects of society, including the needs of the 'knowledge economy' and societal complexity, arguably make the linkage more vital than it might have been in that possibly mythical 'golden age'.
- Paul Ramsden (2001), then Pro-Vice-Chancellor (Learning and Teaching) at the University of Sydney and now Chief Executive of the Higher Education Academy, expressed this booklet's perspective when he stated: "the main hope for realising a genuinely student centred undergraduate education lies in re-engineering the teaching-research nexus." In our view the word 'engineer'

suggests that the link does not occur automatically; it has to be 'designed', 'created', 'constructed', and 'brought about'. The word 're-engineer' suggests that even if once the linkage did exist, it now needs significant 're-inventing' to ensure it is in place or, even better, that it is embedded in many places and processes.

- There is much that individuals, course teams, departments and national systems can and should do to forge these links (Jenkins *et al.*, 2003). However, our focus here is at the *institutional* level.
- We recognise the arguments of the American researcher Burton Clark (1993a) that the role of the institution in shaping teaching-research relations is formative, i.e. setting a general context, with key *enactment* being at the department level. However, we consider that the relative roles of departments and institutions vary between national systems. Clark's views largely reflect the view of the departments in large US research universities. In other state systems and outside the research élite the institution may be a more critical agent.
- Moreover, we suspect that in many national systems, including the research élite US universities, the institution is an increasingly important shaper of teaching-research relations. A key factor here is the increasing national and international competition that is in part driving institutions to attempt to differentiate themselves.
- Institutional policies to link teaching and research are an international phenomenon, and are often driven by institutional imperatives, with or without national policy support. Thus the President of University of British Columbia, speaking at a policy retreat with the University Governors, stated: "The re-emphasis of undergraduate education is probably the most pressing issue that universities must face in the next decade. The challenge is to demonstrate that the learning and research environments, at the undergraduate level are not competitive but complementary" (Piper, 2001).

In the next section we present the national policy context focusing on the UK. In section 3 we review the international research evidence on teaching-research relations at the institutional level, for that research sets a context for institutional interventions and policies. In the following section we provide a framework for defining and understanding what institutions mean by 'linking teaching and research'. Section 5, the largest in the booklet, is designed to help institutions review their current policies and decide on possible further interventions. The range of examples is international in scope – if mainly from the English-speaking worlds of the UK, North America and Australasia.

2. Changes in the UK and elsewhere: teaching 'only' and research-intensive institutions

"Despite the evidence of a synergistic relationship between teaching and research, we make no recommendation about this: it would be wrong to allow teaching issues to influence the allocation of funds for research." (HEFCE, (2000, para 175, p.26)

"On the link between research and teaching, Mrs Hodge (then Minister for Higher Education) said both she and the Education Secretary, Charles Clarke, 'still need to be convinced'. She added: "A good teacher needs good scholarship but I cannot see an inextricable link with being engaged in cutting edge research and being good at teaching.'" (Macleod, 2003)

"I think it would be fair to state that there was a selection of evidence to support a conclusion ... I fear we got into a position in which the intelligence was not being used to inform and shape policy, but to shape policy that was already settled." (Robin Cook, 2003, giving evidence on UK policy concerning Iraq to the Foreign Affairs Select Committee)

More than a century ago Cardinal Newman described the purpose of the university as, "the diffusion and extension of knowledge rather than the advancement. If its object were scientific and philosophical discovery, I do not see why a University should have students ..." (Newman, 1976, preface, quoted by Brown, 1998)

In both teaching and research "universities should treat learning always as consisting of not yet wholly solved problems and hence always in a research mode." (von Humboldt, 1970 quoted by Elton, 2005, 110)

Although discussions of the relationship between teaching and research often refer back to the ideas of Cardinal Newman and von Humboldt in the 19th century (e.g. Brown, 1998; Elton, 2005), this booklet is written in the context of governments worldwide intervening in higher education in the 21st century to ensure high quality research, and seeing the need to concentrate that research in particular institutions. These developments throw into question the interconnections between teaching and research.

This is dramatically revealed in the contrast between two major UK government

projections of higher education policy in 1963 and in 2003. The Robbins Report of 1963 saw the teaching-research nexus as what distinguishes higher education from other forms of education.

“The element of partnership between teacher and taught in a common pursuit of knowledge and understanding, present to some extent in all education, should become the dominant element as the pupil matures and as the intellectual level of work done rises... It is true that only a minority of undergraduates have the ability and the wish to pursue their studies at a postgraduate level; but the presence of work at this level gives intellectual and spiritual vitality to work at all levels in institutions where it is pursued.” (Committee on Higher Education, 1963, para 555)

Forty years later and creating a funding and policy framework for some 40 - 50 % of an age cohort going into higher education, the UK Government’s 2003 White Paper on *The Future of Higher Education* argued:

“At present, the ‘University’ title is reserved for institutions that have the power to award both taught degrees, and research degrees. The right to award research degrees requires that the institution demonstrate its strength in research. This situation is at odds with our belief that institutions should play to diverse strengths, and that excellent teaching is, in itself, a core mission for a university. ... *It is clear that good scholarship, in the sense of remaining aware of the latest research and thinking within a subject, is essential for good teaching, but not that it is necessary to be active in cutting-edge research to be an excellent teacher. This is borne out by a number of studies undertaken over the last ten years. A report in the mid 90s looked at 58 studies which contained ratings of both research and teaching, and found no relationship between the two.*” (DfES, 2003; emphasis added)

Related developments in Australia and New Zealand

Similarly, governments in Australia and New Zealand are reshaping universities and, in particular, their funding to create an expanded and diversified system where the relations between teaching and research are reshaped and, in part, separated.

New Zealand is particularly interesting for there the interconnection between teaching and research is enshrined in national legislation defining a university.

“The New Zealand Education Amendment Act of 1990 identified five characteristics of a University, including ‘*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.41; emphasis added)

In the context of introducing the Performance Based Research Fund (PBRF), directly adapted from the (UK) Research Assessment Exercise (RAE), the Tertiary Education Commission (2001, p.XIII) argued that: 'the legislation requiring that degrees be taught mainly by people engaged in research be amended, to require undergraduate degrees to be taught by people who have a comprehensive and current knowledge of their discipline and the skills to communicate that knowledge'. This proposed change in legislation has not yet been instituted, but many fear that in practice policy has in effect been changed and the pressures for research selectivity may accentuate fractures inside institutions between teaching and research.

Similar pressures are evident in Australia, where proposals are well advanced to conduct a Research Quality Framework, again directly adapted from the (UK) RAE. Brendan Nelson (2005), the Minister of Education, Science and Training, stated that:

"We are as a relatively small country not in the position of being able to afford research which is not of the highest quality. ... In every University in the country, there are educational or teaching courses that are being run where there is no research going on in that particular field. If teaching is so important, if teaching is to be informed by research, what are Australia's teachers doing? ... But we need to ask ourselves: Why does every University ... have to be doing research, teaching and scholarship and struggling to do it in so many areas? Why can't we have Universities that make a conscious decision to specialise in outstanding teaching and scholarship but do very little research?"

Research evidence to guide policy: a misinterpretation of the evidence

The UK Government justified its policy in effect to separate teaching and research with particular reference to research by Hattie and Marsh (1996). This merits further elaboration as this and related research are often used by policy-makers to argue that national and institutional research policy need not support teaching. As we will show, that is not the policy conclusion that the researchers draw from their analysis.

The Hattie and Marsh (1996) study is a meta-analysis, a rigorous re-analysis of previously published studies, pulling out overall conclusions from these separately conducted primary research studies. Many are US-based, reflecting the availability

of comparative student evaluation data. Most are from the 1970s and 1980s. Even leaving aside criticisms of how the teaching effectiveness was measured and the failure of many of these studies to differentiate the levels and types of staff knowledge needed, say, to teach a large introductory course and a graduate seminar (Jenkins, 2004a), what was reported in the White Paper was selective and in Hattie and Marsh's (2004) view misinterpreted their evidence and conclusions.

“Overall, we have consistently found that there is a zero relationship between teaching and research at the individual academic level and at the department level. The greatest misinterpretation and misrepresentation of this overall finding is that it leads to the conclusion that research and teaching should be separated for funding purposes. This conclusion could meaningfully be made IF the correlation was negative, but it is not. Zero means that there can be as many excellent teachers AND researchers as there are excellent teachers, excellent researchers, and not-so-excellent teachers or researchers. Zero does not mean that there are NO excellent teachers AND researchers. It could be claimed that universities have survived with a zero relationship, but that does NOT mean that all academics within those institutions are EITHER researchers OR teachers. The fundamental issue is what we WISH the relation to be, and then we need to devise policies to enact this wish. If we wish to separate teaching and research, this should be based on such a Mission, and a zero or positive correlation is immaterial to this Mission, except to demonstrate that there already are many excellent teachers AND researchers etc. (Indeed, it may be necessary to uncouple those who have research and teaching entwined!). It is reasonable to make a policy decision to separate funding or job descriptions but this can be done even if the correlation is perfect, zero, or negative. Such a policy decision is more a function of where the system wishes to go. Further, our research (so far) has been at the individual and the departmental level, and we have not surveyed or commented on the relationship between teaching and research at the University level. ... We note that the UK White Paper on Higher Education quoted a systematic literature review by Hattie and Marsh to support their argument that research was not necessary for high quality teaching in higher education. But this conclusion could only be made IF the research was based at the institution level, and certainly it misinterprets what a correlation of zero means. We have been careful to disentangle the various levels of analysis - the academic, the department, and the University.” (Hattie and Marsh, 2004, p.1 and p.7)

Furthermore in their original 1996 paper, Hattie and Marsh concluded:

“Based on this review we concluded that the common belief that teaching and research were inextricably intertwined is an enduring myth. At best

teaching and research are very loosely coupled. ... *The strongest policy claim that derives from this meta-analysis is that universities need to set as a mission goal the improvement of the nexus between research and teaching. The goal should not be publish or perish, or teach or impeach, but we beseech you to publish and teach effectively. The aim is to increase the circumstances in which teaching and research have occasion to meet, and to provide rewards not only for better teaching or for better research but for demonstrations of the integration between teaching and research. ...*

Examples of strategies to increase the relationship between teaching and research include the following: Increase the skills of staff to teach, emphasising the construction of knowledge by students rather than the imparting of knowledge by instructors, ... develop strategies across all disciplines that emphasise the uncertainty of the task and strategies within the disciplines, ... (and) ensure that students experience the process of artistic and scientific productivity.” (Hattie and Marsh, 1996, pp. 529, 533 and 544; emphasis added)

So Hattie and Marsh’s work provides us, in part, with a research rationale for interventions at a variety of levels. But before we set out our suggestions for interventions by institutional policy-makers we need to consider the research evidence at institutional level, for, as Hattie and Marsh pointed out, their key research was not at that level.

3. Research on teaching-research relations in institutions

While there have been many studies of teaching-research relations at the individual level, there is far less research at the level of the institution or departments within institutions. Such research is often qualitative, given the issues it seeks to understand. Care has to be taken in seeing this research as providing solid evidence for action, for much of it is of necessity focused on particular institutions in particular national systems. However, such research does give us some clear directions for action.

Research at institutional level has so far largely focused on three areas: how teaching and research are conceived and related in institutional policies; how students and academic staff experience teaching-research relations; and how reward systems support or hinder staff in bringing teaching and research together.

How teaching and research are conceived and related in institutional policies

In the UK, recent policy-orientated research by Gibbs (2001) and JM Consulting (2000) indicates a failure of institutional strategies to link teaching and research effectively, or at least to do this in a purposeful and explicit manner.

As part of a system-wide review of national research policies, JM Consulting (2000), through document studies and site visits, analysed institutional policies for teaching and research. Their finding that few institutions had policies in place to monitor or develop the linkage was quoted in the introduction. They also found that:

“There were some attempts to manage teaching and research workloads in departments, partly to allow more time for research. Some strategies may be having the unintended consequence of driving research and teaching apart for some staff.” (J M Consulting, 2000, p.11)

Gibbs (2001), in a related study for HEFCE, analysed the impact of national funding requirements or inducements for institutional teaching strategies. He concluded that:

“The teaching-research nexus was addressed only to a limited extent. It was very rare for institutions to make any mention of their research strategy in their learning and teaching strategy, and the potential conflicts

or synergies between research and teaching strategies were generally not addressed. ... Mechanisms through which this nexus might be exploited are not yet articulated. ... Strengthening the nexus is at present an aspiration rather than a plan.” (Gibbs, 2001, p.17)

However, the Gibbs and JM Consulting studies were undertaken in the context of the UK system, which separately funds and assesses teaching and research so one should not be surprised that inside institutions this separation is mirrored in policies.

In New Zealand all institutions in 2000-2001 were audited by the National Academic Audit unit for how institutions linked teaching and research and for the effect of this link (Woodhouse, 1998, 2001). In that context Hattie and Marsh analysed the reality behind the institutional mission of one New Zealand institution:

‘The mission statement included ‘retaining a core commitment to research-based teaching and enhancing scholarship through clearly linking research, professional practice and teaching.’ ... However, it was difficult to find this Mission executed in the policy statements. ... For example the only instance in the processes of appointment, continuation, promotion, performance review, or application for study leave was for promotion to the rank of Senior Lecturer, whereby there was a criterion under the teaching category, ‘application of research to teaching’. There was no reference to the nexus in proposals for new courses, student evaluation forms, reviews of Departments, or internal grants procedures. ... We suggest that if such a case study was conducted in most Universities, there would be a similar pattern of rewarding the parts separately, but rarely the nexus. *It is therefore not surprising that the context in which academics work is part of the explanation as to why there is a zero relationship between teaching and research.* (Hattie and Marsh, 2004, pp 5–6; emphasis added)

How students and academic staff experience teaching-research relations

In contrast to Hattie and Marsh’s finding, Elton’s (2001) view is that there ‘may well be a positive link (between research and teaching, but) under particular conditions.’ However, he sees this less in terms of the outcomes (e.g. published papers of staff), which have been prominent in the research correlations studies, than in the extent to which students learn through some form of student-centred or inquiry-based approach, e.g. problem-based learning.

A range of studies in a variety of institutional contexts has revealed much about the student experience of staff research. Research at Christchurch New Zealand

(Robertson, in submission), the University of East Anglia (Zamorski, 2000, 2002) Gloucestershire (Healey *et al.*, in submission), Oxford Brookes (Breen and Lindsay, 1999; Jenkins *et al.*, 1998; Lindsay *et al.*, 2002), and a large 'research-intensive' Australian university (Neumann, 1994) show that across these institutions students perceived significant benefits from staff research, including the credibility of their courses, staff enthusiasm and, to an extent, an understanding of research and research skills. These benefits were more evident at postgraduate level and among those students with an 'academic' as opposed to an 'employability' orientation to their studies. However, some students experienced negative consequences on staff availability related to perceived staff commitments to research. Perhaps most significantly there was at undergraduate level a sense that students 'felt themselves to be recipients of research rather than actors in its production' (Zamorski, 2002, p.417).

A major exception to that sense of students being on the 'outside' of the research world of the university is the study by Blackmore and Cousin (2003) of the particular experience of nine students who participated in Warwick University's Undergraduate Research Scholarship Scheme (see section 5: strategy 8). Those students selected came to feel themselves to be participants, albeit slightly peripheral, in research communities of practice. They had become stakeholders, if only for a short time, in the research functions of the University.

"Ultimately, it is the scheme's ability to provide undergraduates with the possibility of working closely with a professional academic that has been rewarding for me. Not only did it give me a real insight into contemporary academic research but it also provided me with access to a high level of expertise in areas that interest me, which I believe to have been the greatest benefit to me in my involvement in the scheme." (Humanities student) (Blackmore and Cousin, 2003, p.24)

Studies of staff have explored how disciplines shape their conceptions of teaching-research relations and how those perspectives are developed in their courses (Colbeck, 1998; Healey, 2005a; 2005b; Robertson and Blacker, in submission). The ease of linking research and teaching varies between disciplines.

"In terms of subject *content*, the linkages are more difficult to enact in the hard disciplines than in the soft ones particularly before the final year of the undergraduate course, because of the more hierarchical and cumulative construction of knowledge in the former. Hence it is more difficult to incorporate the latest research findings in the undergraduate curriculum in, for example, mathematics than it is in, say, history. In contrast, in terms of the social process it is more common in many of the hard disciplines for undergraduate students, particularly in their final year, to work with staff as part of a research team than it is in the soft disciplines. Hence undergraduate students are more likely to have

opportunities to work as, for example, a research assistant on a research project in a biology laboratory, than to work alongside, say, an English professor interpreting a play.” (Healey, 2005a, 73)

It is as well to remember that many institutional policies on developing the teaching-research nexus may play out differently between departments and will be filtered by the nature of the disciplines taught. However, in terms of shaping policy interventions the most significant area is how departmental-based staff see the institution supporting or hindering effective teaching-research connections and the impacts of national and institutional pressures for high level ‘discovery research’.

Coate *et al.* (2001, p.162), in a study of departmental organisation in the UK, showed that departmental managers found that ‘it is more convenient for teaching and research activities to be treated as separate activities. On an academic level, however, managers would rather perceive the two to be synergistic.’ A study of Built Environment departments in four UK post-1992 universities showed how issues of department organisation and culture - in particular the effective policy separation between teaching and research, and the failure to ask effectively how they can be linked - resulted in failures to support staff to achieve potential synergies between these activities (Durning and Jenkins, 2005).

Two influential studies of the US higher education system (Boyer, 1987, 1990) argued that the institutional focus on ‘discovery research’ (that is, high-level research which, in the UK, maps on to work valued in the RAE) had devalued the system-wide need for an attention to quality teaching and in effect decoupled teaching from research. Much of the initial reform that sprang from these publications was by research-intensive universities seeking to analyse whether undergraduate students benefited from staff research. Here background research led to the view that: ‘The research universities have often failed, and continue to fail their undergraduate populations and thousands of students graduate without seeing the world-famous professors or tasting genuine research’ (Boyer Commission on Educating Undergraduates in the Research University, 1998, p.3). A survey of US research-based universities three years afterwards showed progress by institutions in prioritising teaching and better ensuring that undergraduates benefited from the universities’ research environment. This study concluded that ‘the rhetoric has changed: undergraduate research, for example, is a staple of most universities’ curricular vocabulary.’ But such research-based curricula were still mainly for the most able students (Boyer Commission on Educating Undergraduates in the Research University, 2002, p.29).

In the UK, there has been a range of research studies looking at the impact of the RAE including its impacts on teaching and teaching-research relations. In a HEFCE-commissioned research study of the impact of the 1992 RAE on institutional and individual behaviour, McNay (1997a, 1997b) used focus groups with staff and institutional managers, document studies and questionnaires to

assess the impact of the RAE. McNay (1998, pp.196 and 199) concluded that the funding rewards offered by the RAE led, at the level of the individual, the department and the institution, to 'a gradual separation, structurally, of research from teaching.... Department heads reported good researchers spend less time teaching ... and more undergraduate teaching is done by part-timers and postgraduates'. This perspective was further confirmed by a consultancy-based research study done for HEFCE as part of a 'Fundamental Review of the RAE'.

"In some institutions, the increasing use of teaching-only appointments ... mean that the staff concerned do not have to be entered for the RAE. However, the extensive use of this practice ... would clearly undermine any claim that research was a prerequisite for high-level teaching." (J M Consulting and Associates, 2000, p.15)

How reward systems support or hinder staff in bringing teaching and research together

Internationally there is a range of studies that show staff experience of institutions that give limited recognition to quality teaching in promotion decisions (e.g. Ramsden *et al.*, 1995) and mainly emphasise research. There have been very few studies that have looked at whether institutions provide "rewards not only for better teaching or for better research but for demonstrations of the integration between teaching and research" (Hattie and Marsh, 1996, p.529).

The seminal study in this area is by Colbeck (1998). She provides a detailed study of the academic lives of a small sample of staff in two disciplines in two US institutions, one a 'research-intensive' and one a 'comprehensive' university. She concluded that:

"University policies for evaluating faculty research provided *Cosmopolitan State* (the lower ranked 'Comprehensive' university) with more opportunities than their *Vantage University* colleagues (a Carnegie Research 1 university) to integrate classroom-oriented teaching with research.... The *Cosmopolitan State Faculty Handbook* (which defined research activities for funding and for promotion) began with articles or creative work published in refereed journals but also included textbooks, newspaper articles, and creative work published in popular media ... In effect, *Vantage* research evaluation policies limited research to ... the scholarship of inquiry, whereas *Cosmopolitan State* policies embraced scholarships of inquiry, integration, application and teaching ... *The broader the university definition of what counts for research, the more faculty are able to integrate research and classroom-oriented teaching.*" (emphasis in original)

So while care has to be taken in generalising the findings of this research to other institutions and national systems, it is a rigorous research study which has possible widespread implications. We use it to shape some of the suggested interventions in section 5, but first we want to suggest to you a language to intervene in your institution.

4. Conceptions and definitions of teaching-research links

Christopher Robin finished the mouthful he was eating and said carelessly: 'I saw a Heffalump to-day, Piglet....' 'I saw one once,' said Piglet. 'At least, I think I did,' he said. 'Only perhaps it wasn't.' (Milne, 1926)

"A meaningful science education involves transforming the way in which students think by promoting a progression from 'novice' to 'expert' in both their attitudes and their approaches to the discipline and problem solving in that discipline. Today's educator should aim not simply to produce more scientists, but rather to get all students to learn to think about science like a scientist. Similarly, the goal of education in general is to get students to think like experts more broadly." (Wieman, 2004)

In our work as educational consultants to institutions seeking to effect stronger teaching-research connections we frequently encounter uncertainty as to what is meant by 'linking teaching and research'. In working in your institution, one strategy is to explore staff and students' understanding of what they mean by 'linking teaching and research' (section 5: strategy 3). However, we think it is helpful if we suggest an analytical framework to guide institutional interventions. This framework grows out of the research outlined in the previous section on student and staff experience, and the work of two UK curriculum change projects:

- a) Project LINK sought to understand and enhance teaching and research consultancy links in Built Environment departments and institutional strategies in four UK institutions (www.brookes.ac.uk/schools/planning/LTRC/)
- b) A Higher Education Academy project, which developed the ideas from LINK and disseminated them to seven disciplinary communities (www.heacademy.ac.uk/850.htm).

A developing framework

Griffiths (2004), analysing his and the LINK project team's experience of developing an understanding of what was meant by that simple phrase 'linking teaching and research', developed this typology of teaching-research links.

- **Teaching can be *research-led*** in the sense that the curriculum is structured around subject content, and the content selected is directly based on the specialist research interests of teaching staff; teaching is often based on a traditional 'information transmission' model; the emphasis tends to be on understanding research findings rather than research processes. Limited emphasis is placed on maximising the potential positive impacts of teaching on research.
- **Teaching can be *research-oriented*** in the sense that the curriculum places emphasis as much on understanding the processes by which knowledge is produced as on learning the codified knowledge that has been achieved; careful attention is given to the teaching of inquiry skills and on acquiring a 'research ethos'; the research experiences of teaching staff are brought to bear in a more diffuse way.
- **Teaching can be *research-based*** in the sense that the curriculum is largely designed around inquiry-based activities, rather than on the acquisition of subject content; the experiences of staff in processes of inquiry are highly integrated into the student learning activities; the division of roles between teacher and student is minimised; the scope for two-way interactions between research and teaching is deliberately exploited.
- **Teaching can be *research-informed*** in the sense that it draws consciously on systematic inquiry into the teaching and learning process itself.

Michael Bradford, then Pro-Vice-Chancellor (Learning and Teaching) at the University of Manchester, in developing that institution's learning and teaching strategy, modified the above wording in 2003 to:

- Learning about others' research
- Learning to do research – research methods
- Learning in research mode – inquiry-based
- Pedagogic research – enquiring and reflecting on learning.

Healey (2005a) draws on Griffith's first three categories and adds a further one: research-tutored. He expresses their relationship diagrammatically along two axes, one from an emphasis on research content to an emphasis on research processes and problems, and the other from a student-focused approach to a teacher-focused approach (Figure 1). Many teaching and learning activities may involve a mixture of the four approaches.

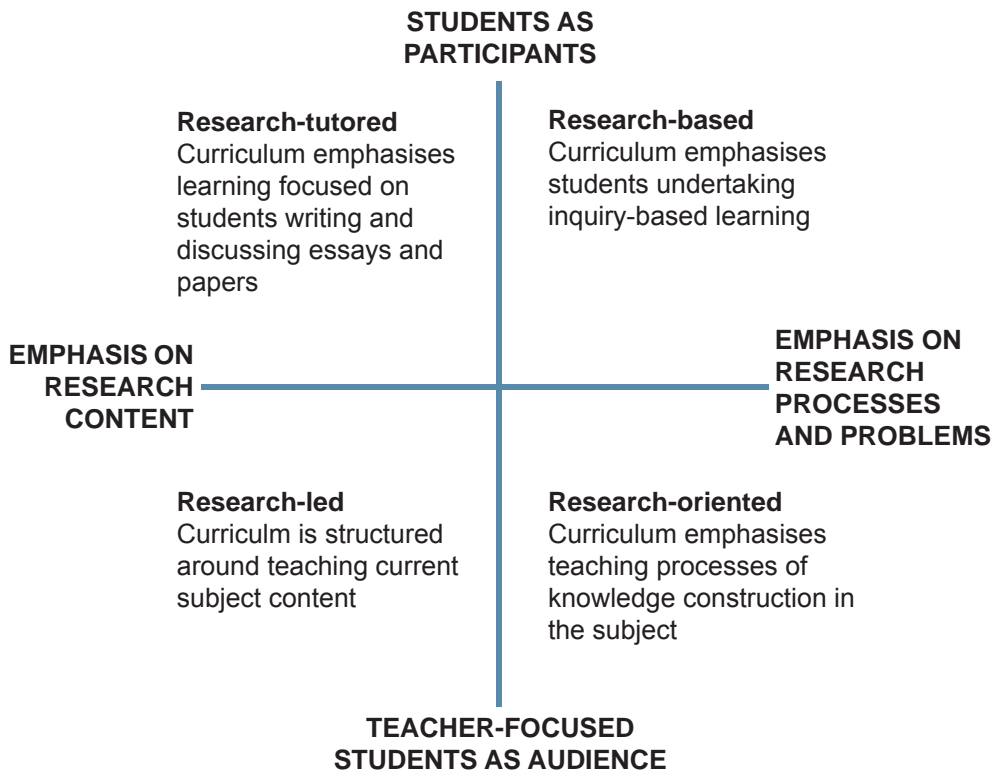


Figure 1: Curriculum design and the research-teaching nexus
Source: Healey (2005a, p.70)

5. Institutional strategies to link teaching and research

“The analyses reveal ways in which it is possible to work to strengthen the connections between teaching and research, and highlight that it is valid and important for universities to address the nexus through measures consistent with their mission, goals and objectives. Since universities differ, it is appropriate that the means also differ.” (Zubrick *et al.*, 2001, p.93)

“How does the institution ensure that teaching and learning are different from what would occur if there were no research and how is this difference measured?” (University of Auckland, 2000, p.19)

“Research, teaching and study can exist in not so splendid isolation, with full time research staff in one corner, some teaching staff off in one corner and only slightly guided, if at all, by the results of recent research, and students studying in another corner, with codified text in hand but out of the sight of research activities and peering at distant teachers as if through the wrong end of a telescope.” (Clark, 1993b, p.301)

This core section provides an analytical framework and a range of international institutional case studies of strategies to bring teaching and research together. There is now a growing range of institutions that have intervened to bring teaching and research together more effectively. Most of these interventions are recent, and few have as yet been researched for their impacts.

We recognise that some see the research élite institutions as being places where teaching and research can be most effectively brought together; perhaps particularly at graduate level (Clark, 1993a). The position taken here is there are undoubtedly particular opportunities for students in research-intensive institutions – though those institutions also have to ensure that such research intensity does not overwhelm their concerns for student learning. However, we also consider that institutions outside the research élite can develop effective teaching-research links appropriate to their resources and perhaps more diverse institutional missions. We also emphasise that our central focus is on the undergraduate curriculum, for that is the core ‘business’ of many institutions and where the research evidence cautions us that the linkages are more problematic. However, the suggested strategies are also generally applicable to postgraduate courses (Table 1).

Table 1: Institutional strategies to link teaching and research: a framework

| | |
|---|--|
| Developing institutional awareness and institutional mission | |
| Strategy 1: | State that linking teaching and research is central to the institutional mission and formulate strategies and plans to support the nexus |
| Strategy 2: | Make it the mission and deliver it |
| Strategy 3: | Organise events, research studies and publications to raise institutional awareness |
| Strategy 4: | Develop institutional conceptions and strategies to effect teaching-research links |
| Strategy 5: | Explain and involve students and parents in your institutional conception of teaching-research relations |
| Developing pedagogy and curricula to support the nexus | |
| Strategy 6: | Develop and audit teaching policies and practices and implement strategies to strengthen the teaching-research nexus |
| Strategy 7: | Use strategic and operational planning and institutional audit to strengthen the nexus |
| Strategy 8: | Develop curriculum requirements |
| Strategy 9: | Review the timetable |
| Strategy 10: | Develop special programmes and structures |
| Developing research policies and strategies to support the nexus | |
| Strategy 11: | Develop and audit research policies and implement strategies to strengthen the teaching-research nexus |
| Strategy 12: | Ensure links between research centres and the curriculum and between student learning and staff scholarship |
| Developing staff and university structures to support the nexus | |
| Strategy 13: | Ensure the nexus is central to policies on inducting and developing new staff and to strategies to support the professional development of established staff |
| Strategy 14: | Ensure teaching-research links are central to policies on promotion and reward |
| Strategy 15: | Ensure effective synergies between units, committees and structures for teaching and research |
| Strategy 16: | Link with related university strategies |
| Strategy 17: | Participate in national programmes |
| Strategy 18: | Support implementation at department level |
| Other strategies you consider appropriate | |
| Based on Jenkins <i>et al.</i> (2003, pp.82-83); see also: www.brookes.ac.uk/schools/planning/LTRC/change/institutions/example.htm | |

Developing institutional awareness and institutional mission

Strategy 1: State that linking teaching and research is central to the institutional mission and formulate strategies and plans to support the nexus

Institutional mission statements can help institutions develop a sense of shared purpose, and shape internal planning. Statements such as the one below can be an important element of an overall institutional strategy.

University of Southampton (UK)

www.ecs.soton.ac.uk/~hcd/LandT/mission.htm

'The University ... is a research-led institution in which teaching and learning take place in an active research environment. ... The University will continue to offer a curriculum which communicates the findings of recent research and which meets the professional standards of its external accrediting bodies. The commitment is to an ethos of curiosity-driven inquiry and intellectual excitement on the part of students and staff.'

However, such fine words need to be implemented through a range of strategies, otherwise the reality will be that revealed by a now dated external Audit of Exeter University that 'there was very little systematic reflection within the University about just what was meant by the claimed interdependence of research and teaching' (HEQC, 1997, p.3).

Strategy 2: Make it *the* mission and deliver it

Most institutions attempt to deliver a range of semi-related strategies. However, there are a few examples where student-based research inquiry and linking teaching and research are at the centre of the institutional mission and its delivery.

Hampshire College (USA)

www.hampshire.edu/flash/index.php

Hampshire is a small private liberal arts college focused on self-initiated, individual research programs of study negotiated by students with academic staff. More specifically:

Beginning and Division 1 Requirements: 'Students must formulate substantive questions on a range of specific subjects and then reflect critically on the implications of the analytical frameworks and methods they used in pursuing the questions.' (Prince and Kelly, 1997, p.7)

Division 2 Requirements: 'Working with at least two or three faculty,

students ... define a substantive area of study and then specify key questions that will serve as general guides through the concentration... In the second step ... the student designs a program of study, including ... independent study.' (ibid., p.8)

Division 3 and Capstone Requirements: This is 'primarily devoted to a ... thesis or artistic project.' (ibid., p.9)

University of Roskilde (Denmark)

www.ruc.dk/ruc_en/about/

In years 1- 2 at least 50% of student time in the assessed curriculum is taught through project work. The projects involve students working in groups guided by staff. 'Problem-orientated project work ... [is] participant directed indicating that it is the group members that collectively ... take the responsibility for the project. ... The result is a body of knowledge owned for the most part by the students that produced it and not borrowed from the teachers who taught it.' (Legge, 1997, p.5)

Strategy 3: Organise events, research studies and publications to raise institutional awareness

Depending upon the 'level' of awareness within the institution, it may be appropriate, for example, to organise events and carry out action research studies to raise awareness and promote an *informed* discussion across an institution. The initial move of a number of institutions towards developing an institutional strategy for the nexus has been to investigate the student and/or staff experience of research. In the UK this has been the approach taken by University of East Anglia (Zamorski, 2000, 2002), Oxford Brookes (Jenkins *et al.*, 1998; Lindsay *et al.*, 2002), Warwick (Blackmore and Cousin, 2003), Gloucestershire (Healey *et al.*, in submission) and Royal Holloway (Turner, 2005). The strengths of this approach include both the 'authority' of the research evidence, but also the power of the student and staff voices (see also section 3).

University of Gloucestershire (UK)

www.glos.ac.uk/adu/clt/resteach/

The University funded a research project into the student experience of research and consultancy (Pell, 2003; Healey *et al.*, in submission) and held a university conference on linking teaching and research (Brown, 2003). These led to an explicit statement being added to the University Teaching, Learning and Assessment Policy:

'The University is committed to developing links between research and teaching. This is achieved by designing curricula so that students ... [have] ... active engagement with research, scholarship and consultancy activities.'

A thematic review is to be held during 2005-06 to identify ways in which this policy can be implemented. The institution is already committed, through its Centre for Active Learning, to embed active learning across the university, an important part of which is to foster inquiry-based learning in the curriculum (www.glos.ac.uk/ceal).

University of Alberta (Canada)

www.uofaweb.ualberta.ca/researchandstudents/

They organised an 'Integrating Teaching and Research Awareness' week, with seminars and workshops; and at student orientation week, they distributed *Research makes sense for students* (a booklet about the programme of the same name), lanyards, mints and fridge magnets!

Massey University (New Zealand)

In the context of the national audit in 2001 of all New Zealand universities on the delivery of effective teaching-research links (Woodhouse, 1998, 2001), they held a university-wide symposium featuring leading external researchers on the issue, presentations from Massey staff, and pre-reading of key research articles. This culminated in an internal publication reporting to the University on the conference and a range of policy suggestions to senior managers (Paewai and Suddaby, 2001). A similar symposium was held at the University of Wollongong (Australia) (<http://cedir.uow.edu.au/nexus/link.html>).

University of New South Wales (Australia)

www.ltu.unsw.edu.au/ref6_research_teaching.cfm

An effective website which provides resources to widen institutional understanding and support effective practice.

University of Ottawa (Canada)

www.uottawa.ca/vision2010/

Vision 2010 proclaimed the mission to be 'a university whose programs are research driven'. A one-day university-wide conference then explored the notion of 'research-based learning' proposed in Vision 2010. The conference sought to agree on a definition of what 'research-based learning' could mean at the University and propose actions to improve the teaching and learning from a 'research-based learning' perspective. (Germain-Rutherford, 2004)

Strategy 4: Develop institutional conceptions and strategies to effect teaching-research links

As institutions differ they need to develop their own conception and understandings of how they conceive and seek to deliver teaching-research relations. One way to

achieve this is to work with (or against!) the grain of an established formulation of ideas. Internationally one of the most significant analyses has been the work of Ernest Boyer and colleagues in the Carnegie Association (Boyer, 1990; Huber and Morreale, 2002; Rice, 2003). They argue for a broad conception of 'scholarship' that values the various roles of universities and academic staff. These are seen as conceptually distinct but potentially operationally linked by institutions, but without assuming that as individuals all staff have to be experts in all. The four scholarships identified were: the scholarship of *discovery research*; the scholarship of *integration*, including the writing of textbooks; the scholarship of *service or engagement*, including the practical application of knowledge; and the *scholarship of teaching*. Boyer (1990, XII), in *Scholarship reconsidered*, argued that US higher education had to 'break away out of the tired old teaching versus research debate.'

One of the strengths of the Carnegie approach is that it does *not* offer a procrustean template. All institutions can use it as prompts to develop a shared language to talk about and implement the nexus in ways that suit their institutional culture below. We demonstrate the value of the Boyer analysis by describing its application in three different Australian universities.

In a desk and interview-based investigation Zubrick *et al.* (2001) analyse how three Australian institutions had sought and achieved effective teaching-research links in very contrasting institutional settings: University of Western Australia ('sandstone' or research-intensive), Curtin University of Technology (professional-focused), and University of Ballarat (regional focus).

At Ballarat the University Council set up a Working Party on 'Developing Scholarship, Research and Student Life' which sought to develop the institution as 'where all [of Boyer's] four scholarships thrive and are valued' (*ibid.*, p.27). Policy developments included: developing academic staff as teacher scholars; involving students in 'field research by students on projects of real significance to the regional community and local enterprises' (*ibid.*, p.28); and departments using the Boyer framework to 'incorporate enquiry-based learning, and integrate teaching with research and community service programs in all years of undergraduate study.' (*ibid.*, p.31)

The University of Western Australia (UWA) set up a 'Teaching-Research Nexus' Working Party chaired by a Deputy Vice-Chancellor, with a remit to examine these issues in the light of the Boyer Commission on research-intensive universities. This working party audited the nexus through department submissions on enhancing teaching quality, gathered examples of department- and discipline-based practices in delivering the link, and identified a number of problems in strengthening the nexus at UWA, including a high number of research-only staff and the isolation of

some research centres from the curriculum.

Curtin has emphasised the application of research as a source of benefits for the economy, the community and the teaching programme. The Curtin application of Boyer included: widening the traditional discovery research to a formulation of 'research' that focuses more on impact (on the economy, on teaching and so on), and developing a matrix of measures to review both teaching and research, so as to 'highlight the nexus between the two areas rather than focusing on the differences.' (ibid., p.50)

Strategy 5: Explain and involve students and parents in your institutional conception of teaching-research relations

Involving students in developing an institutional strategy, and, at a 'minimum', explaining to them the benefits of learning in a research environment makes strategic sense. Student leaders can play key roles in policy formation and in supporting the institution to explain the benefits of research to students. Involving students in such strategic discussions treats them as the adults they are, and also such involvement can better develop their understanding of the role of research in higher education. The interests and concerns of parents also need to be considered, particularly as they frequently influence the decision as to which institutions to study at, and often contribute financially to the cost.

University of Alberta (Canada)

www.uofaweb.ualberta.ca/researchandstudents/

Student Union representatives were central to a Research Office initiated project on strengthening teaching-research relations. (Wuetherick and McLaughlin, 2005) (see also strategy 3)

Hampshire College (USA)

www.hampshire.edu/cms/index.php?id=2844

The Admissions section of the website provides guidance from former students 'Clues that you are a future Hampshire student: When given an assignment, you approach the teacher to ask if you can do it in a different, more creative way.' (see also strategy 2)

Massachusetts Institute of Technology (USA)

<http://web.mit.edu/president/communications/learning-4-94.html>

The President's letter to parents states that 'the value of the undergraduate instruction (at a research university) ... is being called into question. ... At MIT, the faculty – including the most renowned – are as serious about their teaching as they are about their research, and they continually renew the undergraduate curriculum as the intellectual map changes and the world in which we live evolves and transforms. ... The

revolution in molecular and cell biology of the last few decades, led in part by MIT scientists, will touch all of us through its effects on medicine, the environment, and biotechnology. ... MIT is the first university in the country to acknowledge this scientific revolution by adding molecular biology as a required subject for all of our undergraduate students.' (Vest, 2004)

Developing pedagogy and curricula to support the nexus

Strategy 6: Develop and audit teaching policies and practices and implement strategies to strengthen the teaching-research nexus

One broad strategy is to audit the teaching strategies and practices that are already in place and/or develop institutional teaching strategies that seek to strengthen and develop current implicit strategies at institutional and at departmental levels. Certainly in England through national requirements through the Teaching Quality Enhancement Fund many institutional teaching and learning strategies identify their commitment to effective teaching-research links (www.hefce.ac.uk/learning/enhance/tqef.asp).

In developing an effective strategy we suggest that institutions need to decide:

- a) the extent to which the institutional focus is on learning as inquiry
- b) the degree to which schools or departments have freedom to develop the nexus in line with their disciplinary cultures and other strategies
- c) how support departments should develop effective policies to support the nexus
- d) the extent to which the *research* strategies at institutional and departmental levels are, in part, directed explicitly to support the institutional commitment to link teaching and research (see strategies 11 and 12).

University of York (UK)

www.york.ac.uk/felt/gpresource/research&teaching.htm

In 2004 the Forum for the Enhancement of Learning and Teaching initiated surveys focused on the inter-relationship of teaching and research. The three objectives of the survey were: to ascertain how teaching is currently informed by research within departments; to determine whether research is ever informed by teaching, either by individuals or as departmental policy; and to collect examples from individuals of the inter-relationship of their teaching and research. The results of this university-wide survey were then made public on the University website.

University of Southampton (UK)

Its teaching and learning strategy states that it intends 'To ask each academic department to develop a written teaching and learning strategy. ... The strategy ... will include a statement of how research informs its teaching ... (and) should address how the department will take forward ... teaching within an active research environment.' (University of Southampton, 2000, p.3)

In supporting departmental and institutional strategies one approach is to develop special projects and project teams to ensure long-term dedicated support. For as we re-emphasise in the conclusion, implementing this broad focus on linking teaching and research effectively requires action on a range of issues and over some time. That requires dedicated support at institutional and departmental levels (see also strategy 3, University of Gloucestershire).

University of Sydney (Australia)

www.itl.usyd.edu.au/RLT/

The University revised its teaching support unit to focus on specific projects with senior level support and representatives from departments. In the years 2003-5, its project on 'Research-led teaching' supported Faculty Teaching and Learning Plans to evidence how links between teaching and research were being developed; revised its 'Generic attributes of graduates' to help students evidence their knowledge of research; developed a Vice-Chancellor's 'Awards for outstanding teaching' focused on research-led teaching; and created a website for staff development to be placed on the Institute for Teaching and Learning web page.

University of East Anglia (UK)

www.uea.ac.uk/lhi/rltl/

They have funded two linked projects: 'Research-Led Teaching and Learning' (RLTL) took place in 2000 and investigated student perspectives on teaching-research relations in the University (Zamorski, 2000, 2002). The second project, RLTL2 (funded till 2006), builds on this work and involves a researcher and educational developer working with university staff to investigate and develop the research-teaching relationships and shape university strategies. The project includes developing and implementing a better articulation between teaching and research; exploring and documenting how research-led teaching and learning happens in the different disciplines and subjects; enhancing opportunities for students to acquire and use research methods; and developing a sense of research community for postgraduate students. These ideas are promoted through the RLTL unit in the MA in Higher Education Practice course.

Strategy 7: Use strategic and operational planning and institutional audit to strengthen the nexus

Some of the strategies outlined here could result in awareness and effective institutional 'publicity' but limited implementation. One broad strategy to ensure implementation is to use the institutional review and planning process. This could include auditing courses or departments for the various ways and the extent to which they deliver the nexus, and the perceived barriers and effective drivers that operate at institutional level to implementing the nexus. Such an audit could be a themed institution-wide audit for one year, which provides a basis for planning over the next three-year period. The same process could operate at departmental level. Effective teaching-research links can be made a central feature of such planning, and to anticipate strategies 11 and 12, ideally that needs to clearly include research planning and delivery.

University of Sydney (Australia)

www.itl.usyd.edu.au/rlt/usyproject/performance.htm

As part of its commitment to bring teaching and research together (strategy 6) the University has developed a range of performance indicators. These indicators derive from the scholarly literature on research-led teaching and are designed to focus on aspects that can be demonstrated and that clearly distinguish good practice in research-led teaching. Data are required from departments on seven criteria:

1. Student awareness of and active engagement with research
2. Academic staff capacity to integrate research and teaching
3. Curriculum designed to engage students in a variety of research-based activities, induct them into the research community and develop their awareness of research
4. Departmental encouragement for aligning research and teaching
5. Faculty support and encouragement for strengthening the nexus between research and teaching
6. College recognition and support for the development of the links between research and teaching
7. University commitment to the development of strong relationships between teaching and research.

A selection of these measures is then used in determining an element of a department's budget, thus better ensuring implementation. (Brew and Prosser, 2003)

Monash University (Australia)

www.adm.monash.edu.au/cheq/academic/

Monash and Sydney Universities have initiated a benchmarking agreement through jointly examining both institutions' progress towards effective teaching-research links. (Brew and Weir, 2004)

Royal Holloway, University of London (UK)

www.rhul.ac.uk/edc/researchandteaching

The University has developed a benchmarking agreement with the University of Calgary (see strategies 3 and 5) to help progress Royal Holloway's own learning and strategy's focus on research-led teaching. (Hoddinott, 2005; Turner, 2005)

Strategy 8: Develop curriculum requirements

Focussing on the curriculum is, perhaps, the key strategy for institutions. For in the curriculum students should most readily see the reality and the benefits of research-linked teaching. It is also how you can ensure, should you wish, that all students could potentially benefit from this approach.

University of British Columbia (Canada)

www.trek2000.ubc.ca/reports/index.html

In 2000 the University of British Columbia (UBC) announced its strategic plan, Trek 2000, with the commitment that 'All undergraduate students entering UBC by the year 2003 will, in the course of a four-year degree programme, have a research-based learning experience that integrates the many research opportunities at UBC into undergraduate learning. This integration may take many forms, including research seminars, research assistantships, research projects, or research-based inquiry and problem solving.' This is now being progressed through Trek 2010 with firmer operational plans and timetables (strategy 5), for example, all faculties are by spring 2006 to 'Ensure that in each year of their studies all students are exposed in lab or classroom to senior faculty members and researchers in their preferred discipline and to have developed a mechanism for measuring progress towards achieving this [outcome].'

Oxford Brookes University (UK)

www.brookes.ac.uk/publications/bejlt/volume1issue2/perspective/hugginsetal_05.html

In the context of the University-wide move to semesters, in 2002-3 all undergraduate and taught postgraduate courses were redesigned with the requirement that they 'demonstrate how the linkages between research and teaching and learning are realised in the formal curriculum

and the wider student experience.' This process was overseen by a university-wide steering group, the Redesign Advisory Group. (Huggins *et al.*, 2005)

Monash University (Australia)

www.adm.monash.edu.au/cheq/academic/

Among graduate attributes required to be developed in all programmes are developing graduates' independence and lifelong learning skills of written and oral communication, inquiry and research.

McMaster University (Canada)

www.mcmaster.ca/cil/inquiry/index.htm

The University has a tradition of innovative problem-based learning in medicine and engineering. In 1998 it launched an initiative to develop an inquiry-based approach across the whole curriculum, starting initially in selected courses in years one and two. 'Inquiry courses are skill-driven rather than content-driven, focusing on the skills required to perform effectively at university and well beyond university. These generalizable skills help students hone skills equally useful for advanced levels of academic research.' This is supported through the teaching development unit and through programme leadership responsibilities for senior staff. Teaching is done in teams of generally research-active, tenure stream staff, with a three-year rotation, reflecting the commitment needed to teach such courses, but also better ensuring that the skills of inquiry teaching are disseminated across the University.

Some 20% of students in years one and two take at least one inquiry-based course and the research evidence is that such students generally achieve well in subsequent courses. The institution is now faced with the challenge of scaling this innovation across the whole institution or keeping it for those students who select these perhaps more demanding courses. (Elliot, 2005; Sutherland, 2005)

Australian National University (Australia)

www.anu.edu.au/CEDAM/ilearn/inquiry/index.html

The University aims to ensure that all their undergraduate students are introduced to inquiry-learning from the beginning of their program of study. An inquiry-based approach to learning involves students directing their learning by formulating questions, defining problems and investigating issues relevant to their future roles as researchers and professionals. Examples are presented from courses on The Big Questions in Physics; Human Biology; Resources, Environment and Society; Money, Power, War; Science and Public Awareness; and Introduction to Psychology. The site also includes two examples of inquiry-based learning in more advanced courses.

Strategy 9: Review the timetable

Just as staff need blocks of time to do research, so perhaps students involved in research-based learning need a different timetable than the traditional 'dispersed' curriculum where on any one day they study a range of different subjects. In the UK there are examples of institutions that have innovated with radical programmes to enable students to concentrate their time on a research project, particularly in Independent Studies at Lancaster University (www.lancs.ac.uk/depts/indstud/undergraduate.htm) and the Independent Study programme at the then East London Polytechnic (Ainley, 1994). A number of US liberal arts and science colleges have made limited changes to their timetable to create 3-5 hour blocks where students focus on one subject to support inquiry- and research-based learning. (Jungck, 1997)

To an extent those subjects, such as biology, geography and earth sciences, with field-based learning as central to their discipline have limited intensive research-based timetables through field courses that are generally held in the vacation. Many US institutions run their undergraduate research programmes in the summer vacation (strategy 10), for then they can ensure dedicated student focus on one issue, as well as dedicated staff, labs and so on.

Strategy 10: Develop special programmes and structures

While strategy 8 (the curriculum) may well focus on the whole curriculum for all students, a related strategy is to ensure research-based or inquiry-based learning is central for all or particular students over a limited period.

Focusing on a particular period of a degree is already strong in university practices internationally. Ensuring that the final year is largely focused on a dissertation and Honours thesis is a well established practice, as is ensuring that the previous year(s) has a partial focus on training in research methods. While recognising the central importance of these approaches, many institutions have also developed other programmes and structures to further support research-based learning.

Two of the ten recommendations of The Boyer Commission take this approach:

'Construct an Inquiry-Based Freshman Year. The first year of a university experience needs to provide new stimulation for intellectual growth and firm grounding in inquiry-based learning.'

'Culminate with a Capstone Experience. The final semester(s) should focus on a major project and utilize to the fullest extent the research and communication skills learned in the previous semesters.'

(Boyer Commission on Educating Undergraduates in the Research University, 1998, pp.19 and 27)

Some of the initiatives in year one in North America recognise the realities that much introductory teaching will be in large courses. One approach here is to focus resources into such key courses and ensure, through strong curriculum design and involvement of established and tenured staff, that such courses involve students in the research in their discipline.

An alternative and linked approach is to guarantee all or many students one first-year course with small enrolments. Although initially resource-intensive, such courses can 'pay for themselves' through greater retention and increased enrolments in other courses.

Northwestern University (USA)

www.cas.northwestern.edu/advising/seminars.html

All freshmen in arts and sciences are required to take two freshman seminars, which are discussion orientated courses limited to 15 students. ... that introduce them to the intellectual life of the University and help them develop the skills of good scholarship.

University of Toronto (Canada)

www.artsandscience.utoronto.ca/current/fys/index.shtml

First-year seminars are open only to newly admitted students. They are full-credit courses on questions and controversies surrounding a discipline and have a maximum of 24 students each. A linked University strategy is to increase and improve the larger classes and reduce the mid-size classes, thus freeing up resources to increase the number of such first-year seminars. (Farrar, 2005)

Cornell University (USA)

<http://ws.cc.stonybrook.edu/Reinventioncenter/spotlight.html>;

http://biog-101-104.bio.cornell.edu/BioG101_104/explorations/explorations.html

The 'Explorations Program' introduces biology first-year undergraduates to research by Cornell staff, but in the context of a course of 700-900 students. Large-scale funding has created 100-120 'experiences', each of approximately 3-4 hours, for groups of 6-8 students. Most are designed to introduce students to the kinds of research problems on which the academic staff member works. Programs take place both in research labs on campus and at field sites near campus. The program is structured so that each student is required to participate in one 'Exploration' per semester.

Many US institutions have 'undergraduate research' programmes (Kinkead, 2003). These generally involve selected undergraduate students (often those with high

grades and /or motivation for doing research) working with staff in research-based activities often in special summer vacation programmes. There are a number of national grant organisations that support these programmes, including the National Science Foundation (Kaufman and Stock, 2004; Rameley, 2004). Some of these organisations are focused on supporting undergraduate research outside the research élite, for example, the Council on Undergraduate Research (www.cur.org/). The challenge now outside the USA is to adapt their practice and funding to other institutional and national contexts (Jenkins, 2004b). For example, directly shaped by US practice, the University of Rennes (France) has an electronic undergraduate research journal *Biologos* devoted to research in the biological sciences (<http://biologos.univ-rennes1.fr/>); and Ireland has initiated UREKA: The Undergraduate Research and Knowledge Award (www.sfi.ie/content/content.asp?section_id=448&action=search&letter=u&language_id=1).

Massachusetts Institute of Technology (USA)

<http://mit.edu/urop/>

The Undergraduate Research Opportunities Program (UROP) supports research partnerships between MIT undergraduates and academic staff. Formed in 1969, it is one of the earliest such programmes. 'UROP projects take place during the academic year, as well as over the summer, and research can be done in any academic department or interdisciplinary laboratory. Projects can last for an entire semester, and many continue for a year or more. UROP students receive academic credit, pay, or work on a voluntary basis'. MIT is now working with the department of engineering at Cambridge University (UK) to develop an undergraduate research programme there (www.cambridge-mit.org/cgi-bin/default.pl?SID=6&SSSID=495&NewsID=161).

University of Michigan (USA)

<http://sll.stanford.edu/projects/tomprof/newtomprof/postings/222.html>

While many of the early programmes in undergraduate research were science-based, here arts, humanities and design students learn through community-based research directed by academic staff and community leaders. Projects are designed in discussion with community leaders, often last for 2-5 years, and students and staff move in and out of a particular project. This approach is in accord with the ideas of the *scholarship of service or engagement* which see the University and its research directly involved in supporting the concerns of its local communities (Rice, 2003).

There are now a number of UK institutions that have adapted some of these US ideas and practices to either the formal university curriculum or to the wider student experience. Also, though not on the scale of funders in the USA, there is a limited but growing range of UK national organisations supporting these schemes, mainly in the sciences. These include the Nuffield Foundation's Undergraduate Research Science

Bursaries (www.nuffieldfoundation.org/go/grants/sciurb/page_93.html) and Wellcome Trust Vacation Scholarships (www.wellcome.ac.uk/node2124.html).

University of Chester (UK)

www.chester.ac.uk/origin/index.html

There is a linked set of University initiatives focused on publishing and disseminating student research. It began with *Origin*, a journal of undergraduate research in the biosciences, but with links to Psychology, Geography and Sports Science. The scheme is now being extended to the School of Education. In addition Business and Management maintain a database of student research and Social and Communication Studies run a student and practitioner research conference.

Imperial College London (UK)

www.imperial.ac.uk/P1772.htm

The Undergraduate Research Opportunities Programme (UROP) gives students the chance to take part in the activities of College research groups. Founded in 1980, this is the earliest example of such a programme in the UK and was directly based on the MIT scheme. The scheme focuses on students in year two and is often used to develop ideas for their final-year dissertation or project. While most projects are undertaken in the summer they can also take place in term time. Students are awarded bursaries for their work from a variety of sources but most commonly from supervisors' research funds, general departmental funds or external funds such as the Nuffield Foundation's Undergraduate Research Science Bursaries. In 2004-5, 326 students participated in the scheme.

University of Warwick (UK)

www2.warwick.ac.uk/fac/soc/pais/currentstudents/urss/

Again adapted from US experience, the Undergraduate Research Scholarship Scheme enables some 10-15 second-year students per year to take part in independent research guided by staff. A limited number of bursaries are available for students to carry these out either full-time during the vacation or part-time during term or vacation. This scheme will now be significantly expanded and become a significant feature of Reinvention Centre for Undergraduate Research at the Universities of Warwick and Oxford Brookes (www2.warwick.ac.uk/fac/soc/sociology/research/cetl/).

Some may see the limitations of these programmes in meeting the needs of selected students only. Others may see them as meeting the needs of students with a strong research orientation. Such programmes can provide a test-bed for ideas that later permeate the wider curriculum, or can be extended across the institution. The Undergraduate Research student office at MIT conducts an audit

of UROP participation among graduating seniors each year. For the class of 2004, 82% of graduating seniors had participated in UROP at least once during their undergraduate careers. (MIT, 2005)

Developing research policies and strategies to strengthen the nexus

Strategy 11: Develop and audit research policies and implement strategies to strengthen the teaching-research nexus

In our review of the research evidence (section 3) we showed that the available evidence is that while institutional mission statements often emphasise the teaching-research nexus, the reality of practice is that teaching and research are often organised, funded and delivered separately. Moreover, where specific strategies have been developed to bring them together, these initiatives are largely, or even entirely, a function of teaching strategies and funding, except perhaps for selected pedagogic research initiatives. In addition there is strong evidence that an institutional focus on high level discovery research and external funding for research can both devalue the institutional commitment to teaching, and in effect sever the (potential) connections between 'active researchers' (tenure track staff) and the undergraduate curriculum.

Graham Gibbs stated: 'I have yet to see a research strategy which took its implications for teaching seriously' (Gibbs, 2002). Yet King Alfred's College was featured by Gibbs (2003) in a later publication which described how the institution developed a research strategy that directly aligned research with teaching. Specifically 'schools (departments) are expected to identify research priorities that support the curriculum and underpin teaching. Bids for research funding supported by the Research Assessment Exercise (RAE) and other funds must demonstrate how the research will feed into, and support, the teaching of courses. Criteria clearly state that only research projects that underpin teaching will be funded.' However, since then King Alfred's College has become the University of Winchester, and its Vice-Chancellor, Paul Light, was recently quoted as stating: 'The choice that faces us in terms of research and knowledge transfer is not so much whether we want to do as whether we want to make more of a commitment in relation to the RAE or, in a broader way to encompass more staff' (Tysome, 2005, p.4).

Internationally the one strong example we had was Earlham College (USA), a small private Quaker College. In the mid 1990s, that institution developed an innovative research policy that required requests for research support to include a *pedagogic impact statement*. This involves 'a description of the impact that the research is likely to have on teaching. ... One of the Deans who developed this system argued "Let's talk about teaching and research at a point when something actually can be done to insure that they complement and reinforce each other"

(Bakker, 1995). However, that policy no longer appears to be operational. So internationally we have no knowledge of strong current case studies of institutions that have directed specific strategies that ensure that the institutional research policy is, in part, directed to supporting the undergraduate curriculum. That does not of course mean that such links are not there. But it does indicate that at present the specific strategies to ensure the links are largely from the 'teaching' side. It also suggests that the negative impacts of research selectivity on teaching are probably not being addressed through institutional research strategies.

Recognising that that there will be evident differences between institutions, we suggest the following broad policy directions:

1. Monitor and support the involvement of high-level researchers in the curriculum (See strategy 12)
2. Monitor how the institution and schools manage any possible negative impacts of research, for example, staff not being available to students during research leave
3. Ensure that certain research income streams are directed to support the curriculum and student learning through research
4. Require pedagogic impact statements, adapted from the experience of Earlham College, for institution- and school-based research funding and policies
5. Explicitly value pedagogic research and monitor this for funding and promotions
6. Explicitly value integrative scholarship, textbooks, e-learning materials; support and monitor these for funding and promotions (strategy 14)
7. Seek synergies and overlapping structures between the research and teaching committees and related structures (see case studies of University of Canterbury, Christchurch in strategy 15, and Southampton Solent University in strategy 13).

Strategy 12: Ensure links between research centres and the curriculum and between student learning and staff scholarship

In many universities research is concentrated in research centres. There are evident arguments for this in terms of the organisation of research. For institutions that wish to develop an effective teaching-research nexus, the evident danger is that such centres may have little or no beneficial impact on teaching. Rather they

may have the 'unintended consequence' of driving apart teaching and research.

Such centres can in part support the teaching-research nexus, through:

1. Challenging or requiring centres to develop strategies to connect to teaching that they think effective
2. Making one of their functions supporting and teaching selected (postgraduate) courses
3. Providing opportunities for mainline teaching-focused staff to have periodic research roles in the centre
4. Ensuring that selected centre staff play roles as consultants to course teams and have limited teaching roles in academic departments
5. Supporting centres in making their research available to course teams and students in the institution
6. Paying attention to the external and internal design of the building to avoid impression that they are 'student free' zones (see strategy 16)
7. 'Establishing *formal* organisational connections ... that allow opportunities for senior undergraduates and honours students to have 'affiliations' during their studies.' (Zubrick *et al.*, 2001)

University of Western Australia (Australia)

The nexus is one of the four expected features of centres. University guidelines state that: 'A centre should enhance the teaching-research nexus in clearly identifiable ways through its activities or through the activities of individual members. In particular, research staff in centres should be encouraged to contribute to teaching and/or supervision of students enrolled in cognate departments.' (University of Western Australia, 2001)

Developing staff and university structures to support the nexus

Strategy 13: Ensure the nexus is central to policies on inducting and developing new staff and to strategies to support the professional development of established staff

Institutions can shape effective teaching-research connections through how they educate graduate students and support new staff; and then in the ways they support the professional development of established staff.

Graduate Training Programmes have generally focused exclusively on research training, with the recent introduction of limited 'training' in teaching for graduate students who also teach. There are increasing national and institutional initiatives such as the US Carnegie Foundation Initiatives to 'reinvent' the doctorate and make it relevant to both the changing nature of 'knowledge' and to the diverse roles and professions that postgraduates now enter (www.carnegiefoundation.org/CID/). As part of that broader reform, there are examples (see case studies below) that seek to bring teaching and research together in doctoral training. This is particularly important in those large graduate schools in research-intensive universities, for it is in those institutions that most new academics receive their training. Gaff and Lambert (1996, p.38) have pointed out that in the US 102 universities award 80% of all doctoral degrees each year, and 'these few universities operate as a funnel through which the vast majority of faculty members in America's 3,500 diverse colleges and universities must pass.' There are evident parallels in other national systems. The danger is that these graduate students will be inducted into a culture in which only discovery research 'counts'. There is an opportunity to induct them into a broader view of research and a conception of teaching that is research-based, and to show them how better to link teaching and research in their academic careers.

Stanford University (USA)

www.stanford.edu/group/i-rite/

The I-Rite Program provides training to doctoral students (and mainstream researchers) on how to write and communicate their research to a wider public, including new students in their discipline. (Marincovitch and Reis, 2000)

Madison University (with Michigan State University and Pennsylvania State University) (USA)

<http://cirtl.wceruw.org/index.html>

The Center for the Integration of Research, Teaching, and Learning in science, technology, engineering, and mathematics focuses on changing the practice and culture of graduate training, through developing their understanding and practice of 'teaching as research.' (Mathieu, 2004)

University of Oxford (UK)

www.learning.ox.ac.uk/iaul/CETL.asp

The Centre for Excellence in Preparing for Academic Practice, starting in September 2005, will adapt the ideas of the US doctoral initiatives above to the UK context.

Internationally there are increasing moves to ensure that on appointment new academic staff receive training or education in teaching; for example, in the UK, through institutional programmes accredited through the Higher Education Academy. There is an increasing number of such institutional programmes that

include consideration of how to link teaching and research in the curriculum (see, for example, UEA case study in strategy 6) and there is national support for such initiatives through the Higher Education Academy's *Supporting New Academic Staff* Project (SNAS) (www.heacademy.ac.uk/snasdatabase.asp). However, that leaves the link on the teaching side and confined largely to the first one or two years that staff are in post, although the case study below extends the course to established members of staff.

University of Plymouth (UK)

www.plymouth.ac.uk/pages/view.asp?page=8086

A 20-credit Masters level module on 'Teaching Research' within the Learning and Teaching in Higher Education course provides the opportunity for both new academics and established members of staff to examine the links between research in their own discipline and their teaching. The intended learning outcomes are that participants should be able to construct theoretically-informed arguments about the relationship between teaching and research, explain and justify their own position with regard to becoming/being a teacher of research and explain the principles and critically appreciate the practices of teaching research.

Courses on teaching can be experienced by staff as separate from and competing with their role as researchers. Perhaps a more fruitful way forward would be to think of initial support as building on a more integrated basis in doctoral training (see above); and then on appointment as academic staff, initial training and (teacher) accreditation should be an integrated and/or linked 'programme' in both teaching and research over say the first three to five years. This would require changes to institutional structures and values (see strategy 15). We have no strong institutional case studies in this section. However, in the UK, the Higher Education Academy's (2005b) standards framework offers a national structure for those institutions who want to ensure that initial support for teaching and research are integrated.

Then building on this integrated foundation, the institutional task is to ensure continued professional development and support that seeks integration through inter-linkages between units concerned with teaching and research development, human resource strategies, appraisal and reward (strategies 14 and 15). Clearly the form of CPD strategies will vary between institutions. The case study below is one from outside the research élite.

Southampton Solent University (UK)

www.solent.ac.uk/sihandbook/Personnel/default.asp?level1id=3713&level2id=4799&level3id=4808

The University has developed 'an advanced scholarship strategy' requiring and supporting all staff to be involved in work that directly focuses their scholarly and research time on scholarship supporting

student learning. Such work varies by disciplinary groups across the institution, but has to result in a visible output in the public domain, carry peer esteem and contain an aspect of originality. (Brown, 2003) (see also strategy 15)

Strategy 14: Ensure teaching-research links are central to policies on promotion and reward

There is now strong research evidence both on the importance of promotion and reward policies in effecting institutional cultures and practices that affect teaching quality, and on how most institutional policies are seen as promoting research and neglecting teaching (e.g. Ramsden, 1998). That research clearly demonstrates the importance of institutions reviewing their promotion policies and their practices to ensure that teaching is really valued – in line with their institutional mission.

If that mission sees linking teaching and research as a priority, then institutions need to review their promotion and appraisal policies for all levels of academic staff to ensure that there are '*rewards not only for better teaching or for better research but for demonstrations of the integration between teaching and research*' (Hattie and Marsh, 1996, p.533; emphasis added).

Some institutions may want to support and reward staff for specialised roles, such as 'teacher', or 'researcher', or someone engaged in 'knowledge transfer' or 'community development', while still ensuring that the overall effect of such specialised roles does not detract from effective teaching-research links in the experience of students and staff. Others may want to ensure that in promotion and evaluations the *integration* of these different roles is recognised and encouraged (Colbeck, 2002).

There is now a range of institutions that have directly changed their reward structure to focus on teaching-research links (Jenkins, 2004c). One strand of these rewards focuses on rewarding staff who have demonstrated effective teaching-research links in their practice. Another strand is to reward (young) researchers who will then involve undergraduates in their research. Most of the rewards are at the level of the individual, and some at department level.

University of Toronto (Canada)

www.alumni.utoronto.ca/events/awards/frye.htm

The Northrop Frye Awards are co-sponsored by the University of Toronto Alumni Association and the Provost of the University. Annually one faculty member and one department are recognised for demonstrating exemplary and innovative ways of linking teaching and research.

University of Victoria, Wellington (New Zealand)

www.utdc.vuw.ac.nz/excellence/awards2005/

Teaching Awards are ‘awarded to applicants who demonstrate excellence in integrating their academic research effectively in their teaching, engaging undergraduate students in research, and/or carrying out research on teaching and learning in their disciplines.’ (Angelo and Asmar, 2005)

University of Western Australia (Australia)

In the context of an institutional mission to link teaching and research, departments were encouraged (through significant financial rewards) to develop an electronic portfolio of their teaching strategy which was placed on the University Intranet. The main prize went to the English department, and as one of the staff commented, preparing the portfolio had ‘engaged us as a group of academics collectively and systematically in thinking about our practices ... and how teaching and research enabled one another.’ (Zubrick *et al.*, 2001, p.124)

Strategy 15: Ensure effective synergies between units, committees and structures for teaching and research

Most institutions now have some unit that works with staff to improve their teaching. Most have similar units to support research. There are committees concerned with teaching and committees concerned with research. However, on most campuses these are separate.

Yet if an institution really intends to link teaching and research then it should consider how such units and committees are conceived and organised. It is possible that more effective synergies could be developed through reshaping, merging or co-locating functions of such units, through instituting periodic consultations and projects to ensure synergies.

University of Canterbury, Christchurch (New Zealand)

www.uctl.canterbury.ac.nz/

In the context of national audits in 2001 (which evaluated all New Zealand universities for their effectiveness in linking teaching and research – see Woodhouse, 2001) and in 2005 (where the primary focus was on teaching) the University’s two separate committees for teaching and research formed joint working parties to report, raise issues and propose policies on the research-teaching nexus. These drew on institutional documents and empirical data gathered from staff and students which provided both strong evidence of what was in effect already in place in institutional and department practice, but also gave directions for action. The reports of these working groups are being used to shape interventions in institutional policies, for example by providing guidelines

to research centre directors and heads of department about how to use the relationships between research centres and departments to enhance both teaching and research; and by proposing that departments implement an active programme of raising student awareness of research. (Spronken-Smith, *et al.* 2000; Gerrard *et al.* 2004)

Southampton Solent University (UK)

In 2000 the institution had a special meeting of its then totally separate committees for teaching and research. The meeting was solely concerned with teaching-research relations at the institution. A 'full and frank discussion' ensued, but from it emerged greater understanding of the issues and the development of a set of 'horizontal strategies' at institutional and faculty levels to bring teaching, research and scholarship together, including the Advanced Scholarship Strategy described in strategy 13.

Strategy 16: Link with related university strategies

For all institutions, linking teaching and research will be but one of a range of missions and strategies, even for those institutions where it is right at the core of the institutional mission. Institutional policy-makers need to ensure synergy between strategies for linking teaching and research with other related strategies. So far we have mainly shown how aspects of the teaching, research and human resource strategies can be interlinked. But other strategies can and should be linked, in particular the e-learning, library and space strategies. But in some cases, other aspects of institutional strategies might be centrally linked to the teaching-research focus, such as strategies for widening participation and community links.

Anglia Polytechnic University (UK)

<http://web.apu.ac.uk/uclt/uclt/fellows.phtml>

An institutional teaching fellowship enabled a librarian to investigate how institutional library policies could better support effective teaching-research links. (Garfield, 2005)

University of Calgary (Canada)

[http://commons.ucalgary.ca/inquiry/;](http://commons.ucalgary.ca/inquiry/)

www.communitiesofinquiry.com/sub/coi_model.html

The University has an institutional strategy that sees student inquiry as 'core to a research-intensive university'. The e-learning strategy has been reshaped to directly support student inquiry with a focus on developing 'communities of inquiry' using computer conferencing.

Malaspina University-College (Canada)

<http://research.mala.bc.ca/centers/index.asp?document=ScienceCtr>

The institution is in the initial stages for planning for a new Integrated Science Centre. This provides the Faculty of Science and Technology with the opportunity to link research and teaching into the design of the facilities. Students will take specific courses with a strong research component, often requiring extended use of laboratory spaces instead of the traditional three-hour classroom sessions. New lab spaces will be designed to accommodate this. Faculty research areas will be places where students will engage in research with their teachers using an apprenticeship model combined with problem-based teaching. The new building will also contain many spaces where students can work in groups, with each other and with academic staff, on research projects, both inside and outside the laboratories.

The University of Maryland (USA)

www.hhmi.org/bulletin/may2001/intractable/umbc.html; www.umbc.edu/Programs/Meyerhoff/Undergrad/

Minority undergraduate students in what is largely a 'white' institution work with academic staff in summer and term research programmes, with the aim of increasing 'minority' graduates in the sciences. A related programme operates at the University of Missouri. (<http://web.missouri.edu/~gradschl/special/LS-MoAMP/>)

Sheffield Hallam University (UK)

www.shu.ac.uk/schools/cs/corvey/

The Corvey Women Writers on the Web Project manages an electronic research database of women writers, which is used by students to research and publish electronically.

University of Washington (USA)

www.lib.washington.edu/researchAward/

The University Libraries, in co-operation with the Undergraduate Research Program, sponsor the 'Library Research Award for Undergraduates' competition, recognising students who produce significant inquiry requiring use of information resources, the library and its collections.

Strategy 17: Participate in national programmes

Institutions can support further integration on the campus by institutional leaders taking a prominent role in shaping national policies and supporting staff and departments to participate in discipline-based initiatives aimed at developing good practice in linking teaching and research. In the USA the Carnegie Foundation is clearly a major leader in campus-based initiatives to bring a scholarly perspective to teaching, the Reinvention Center for Undergraduate Research at Stony Brook

is a catalyst for change in research-intensive universities (www.sunysb.edu/Reinventioncenter/), and the Council for Undergraduate Research is active in institutions outside the research élite (www.cur.org/). In Australia the Carrick Institute for Learning and Teaching offers a national policy and funding framework that could support institutional interventions (www.carrickinstitute.edu.au/carrick/go).

In the UK institutional leaders support staff and department leaders in working with the range of initiatives. The Higher Education Academy has already developed initiatives to ensure that the links are better developed through initial courses on teaching and CPD; through involvement with initiatives through the Subject Centres; and through links with the Centres for Excellence in Teaching and Learning focused on research and inquiry-based learning.

These include:

1. University of Gloucestershire, the Centre for Active Learning in Geography, Environment and Related Disciplines (www.glos.ac.uk/ceal/)
2. University of Manchester, Centre for Excellence in Enquiry-Based Learning (www.eps.manchester.ac.uk/tlc)
3. University of Oxford Centre for Excellence in Preparing for Academic Practice (www.learning.ox.ac.uk/iaul/CETL+main.asp)
4. University of Reading Centre for Excellence in Teaching & Learning in Applied Undergraduate Research Skills (www.rdg.ac.uk/cdotl/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) (http://portal.surrey.ac.uk/portal/page?_pageid=736,316367&_dad=portal&_schema=PORTAL)
7. Universities of Warwick and Oxford Brookes, The Reinvention Centre for Undergraduate Research www2.warwick.ac.uk/fac/soc/sociology/research/cetl/

In addition, the Academy now supports the Research and Teaching Forum for those interested in research in this area (www.heacademy.ac.uk/RTForum.htm).

So in the UK and elsewhere there are a range of projects and structures that can support institutions taking this route.

Strategy 18: Support implementation at department level

In the introduction we referred to Burton Clark's view (1993a) that the role of the institution in shaping teaching-research relations is *formative*, i.e. setting a general context, with key *enactment* being at department level. However, we have demonstrated that institutions can and should play a central role and that they have potentially a wide range of possible *institutional* 'policy levers' .

Most of these need 'enacting' at departmental level and adapting to departmental and disciplinary cultures (Healey and Jenkins, 2003). Institutions can support that process through a range of measures including:

- a) holding events where departments share good practice and discuss how they are dealing with problems in implementation
- b) requiring strategy documents and, in particular, budget allocations to implement the overall strategy
- c) processes of internal quality assurance, but recognising and celebrating that departments and course teams will implement this in very different ways in accordance with local conditions.

The Academy has published a booklet providing guidance to departmental interventions (Jenkins and Zetter, 2003).

Other strategies you consider appropriate

Clearly you may see other strategies you think will be effective in your institution.

6. In conclusion: back to the future

“Research activity can and does serve as an important mode of teaching and a valuable means of learning ... student involvement in research is an efficacious way to educate throughout the education system the great mass of students, as well as the elite performers, for the inquiring society into which we are rapidly moving.” (Clark, 1997, p.242)

The above analysis has emphasised:

- a) the national contexts where governments are in effect often working to break or ignore the importance of linking teaching and research
- b) the view that student understanding of the complexity of knowledge is what distinguishes higher education
- c) that the research evidence is not the ‘bleak picture’ that some governments have presented and does not justify creating ‘teaching-only’ universities
- d) the reality that the ‘traditional’ model of the teacher and researcher surrounded by a small group of students is clearly impossible in the context of today’s higher education. What is both possible and essential is to ‘re-engineer’ or ‘reinvent’ higher education to ensure that all students in all higher education institutions learn in a research environment.
- e) the perspective that in valuing ‘linking teaching and research’ institutions need to intervene purposely to maximise the potentially positive relationships and minimise any negative consequences.

In particular, we have sought to show the wide range of interventions that have been made by institutions internationally. We have still much to learn, but we also have much to build on. In our view the way forward is, in part, to ‘go back’ to the view and the academic values of ‘teaching and research’ and ‘student and academic’ as being linked in a common enterprise, as we saw in section 1 enshrined in the (UK) Robbins Report in 1963. Recently these values have been developed and reinvented through concepts of ‘co-learning’ and ‘communities of inquiry.’ (Brew, 2003; Healey, 2005a; Le Heron *et al.*, 2006; Robertson and Bond, 2005)

Angela Brew’s (2005) challenge to us in bringing teaching and research together is:

‘how can we create inclusive scholarly communities of learning where the academic venture is viewed as a partnership between individuals who bring different skills, levels of expertise and interests to it?’ She also asks whether institutions, in seeking to bring teaching and research together, bring students into research, but keep them at arm’s length, or are they invited and supported to come into our communities of researchers? A further challenge is whether we work in partnership with students inquiring into the best ways to learn together (Brew, 2005).

At national levels there are reasons to be optimistic about the policy climate in which institutions will be operating. Particularly significant are the thinking and policies recently developed by the influential (US) National Science Foundation. It recently revised all its grants and policies based on the perspective that:

“Research and education are not – and never have been – mutually exclusive realms.” (from GPRA Strategic Plan FY106; Core Strategies; cited in Rameley, 2004)

“Effective integration of research and education at all levels infuses learning with the excitement of discovery. Joining together research and education also ensures that the findings and methods of research are quickly and effectively communicated in a broader context and to a larger audience.” (GPRA Strategic Plan FY01-06; cited in Rameley, 2004)

With these perspectives and values in 2003 the National Science Foundation has radically redesigned its programmes and grants to ensure that the ‘methods of research are quickly and effectively communicated in a broader context and to a larger audience’ (NSF, 2003). This has led to a significant strengthening of a whole range of policies and funding streams to bring teaching and research together (Kaufman and Stock, 2004).

In the UK, the response to the Government’s proposals to create ‘teaching-only universities’ and fears as to the impact of the RAE on teaching-research relations led to the Government establishing the Research Forum to examine teaching-research links in the context of growing research selectivity.

The Research Forum Report (June 2004)

www.dfes.gov.uk/hegateway/hereform/heresearchforum/index.cfm

The report concluded that:

“research and teaching are essential and intertwined characteristics of a university which can be advanced from two perspectives:

- that of the students acquiring a ‘higher education’, and
- that of the work of academic staff employed in higher education”

“International experience suggests that there are various ways in which the students’ learning experience can be effectively enhanced – ranging from vicarious exposure to the current research of their teachers through to the immediate impact of being researchers (broadly defined) in their own right ...”

“... It is becoming clearer that those students who are not learning in an HE environment that is informed by research, and in which it is not possible to access research-related resources, are at a disadvantage compared to those who are ...”

The group then proposed a special fund for those outside the research élite to support student learning in a research environment.

The Minister (for HE) response (November 2004)

www.dfes.gov.uk/hegateway/herereform/herereformforum/index.cfm

“I am aware of the complexity of the issues surrounding teaching and research in particular, and it is to the Forum’s credit that it has suggested a way forward.”

The Funding Decision from DfES (December 2004)

www.hefce.ac.uk/news/hefce/2004/grantletter/letter.asp

“The Higher Education Research Forum was set up a year ago under the chairmanship of Sir Graeme Davies, to look into how we could more closely link teaching and research. One of its main proposals was that less research-intensive institutions should be supported in developing a research-informed teaching environment. We support the principle of this proposal and have therefore included in the attached teaching grant figures sums of £2.5/7.5/15 million over the next three financial years for this purpose. We anticipate that HEFCE will allocate these funds according to a formula in inverse proportion to current levels of research funding, and expect the Council to manage this funding in a way which minimises the burden on individual institutions.”

Clearly these funds are limited, though they will be welcome to many institutions. What is more significant is the shift in Government thinking and the recognition that for universities to support honours-level dissertations their students need to learn in a ‘research-informed environment’. It remains to be seen whether other countries, such as New Zealand and Australia, which are embarking on their versions of the RAE, will also recognise the need to retain and enhance research-informed teaching environments.

However, important as these national issues are, that is not where we should end and hopefully you ‘begin’ or ‘carry on’. The danger of ending with a discussion of national policies is that this might suggest that without effective national policies

there is little that institutions (and departments) can do. We hope that this booklet shows that much has already been achieved by institutions worldwide, often in unsupportive national environments; and that it will help you to reflect on what you already have in place in your institution and give you ideas and strategies with which to go forward.

Authors' biographies

Alan Jenkins is an educational developer and researcher at Westminster Institute, Oxford Brookes University and Reinvention Fellow of the Reinvention Centre for Undergraduate Research at the Universities of Warwick and Oxford Brookes. Alan taught and researched geography and contemporary China studies and was a founding editor of the international *Journal of Geography in Higher Education*. He is an Academy Associate Practitioner and higher education adviser for the Higher Education Academy Geography, Earth and Environmental Sciences Subject Centre.

With colleagues at Oxford Brookes University he has researched undergraduate and postgraduate views of staff research. In 2003 they published *Reshaping higher education: linking teaching with research* (Jenkins *et al.*, 2003). He was adviser to the FDTL Project LINK, 'Linking teaching, research and consultancy in built environment disciplines'. As part of that project he has researched with Bridget Durning how issues of department and disciplinary cultures, and department organisation, shape teaching-research relations.

He directed an LTSN Generic Centre Project (2002-3) 'Linking teaching and research in the disciplines.' As part of that project, he co-wrote *Linking teaching and research in departments* (Jenkins and Zetter, 2002). The following year he wrote *A guide to the research evidence on teaching-research relations* for the Academy; and with Mick Healey he is directing a project for the Academy's SNAS (Supporting New Academic Staff) Network on linking teaching and research in higher education teacher accreditation and Continuing Professional Development (CPD) courses.

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Mick Healey is Professor of Geography at the University of Gloucestershire. He is the Director of the Geography Discipline Network (GDN) and Senior Adviser for Geography to the Higher Education Academy's Subject Centre for Geography, Earth and Environmental Sciences. He is Co-Director of the Centre for Active Learning in Geography, Environment and Related Disciplines and Co-Director of a four-year Economic and Social Research Council project on 'Enhancing the quality and outcomes of disabled students' learning in higher education'. He is also co-chair of the International Network for Learning and Teaching Geography in Higher Education.

In 2000 he was awarded a National Teaching Fellowship. He is co-author of a paper awarded the *Journal of Geography in Higher Education* Biennial Award for Promoting Excellence in Teaching and Learning (2003). In 2004 the Council of the

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He has written and edited over 100 papers, chapters, books, guides and reports on various aspects of teaching and learning in higher education, including several on linking research and teaching and inquiry-based learning. In the last ten years he has given over 150 educational workshops, seminars and conference presentations in Australia, Canada, New Zealand, Singapore, South Korea, UK and US. He is on the Editorial Board of the *Journal of Geography in Higher Education*. He has acted as an advisor to the Higher Education Funding Council for England, the Higher Education Academy, the Higher Education Authority for Ireland, and several higher education institutions and projects in Australasia, Europe, UK and the US.

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