Linking research and teaching: exploring disciplinary spaces and the role of inquiry-based learning

Mick Healey

Introduction

Much of the international debate about the relationship between research and teaching is characterised by difference. Individuals vary widely in their views about the nature of the linkage. Some believe that "university research often detracts from the quality of teaching" (Pocklington and Tupper 2002: 7), while others argue that "courses taught by those at the cutting edge of research will necessarily be of higher quality than those taught by those merely using the research results of others – whatever the apparent quality of their style of delivery" (Lee 2004: 9). These strong views in part reflect the importance of linking research and teaching in the identity of many academics (Henkel 2000). The research evidence also varies, at least in its interpretation. For example, Hattie and Marsh (1996) found no significant relationship between research productivity and teaching effectiveness; on the other hand, "there is clear evidence from a range of studies in different types of institutions of students valuing learning in a research-based environment" (Jenkins 2004: 29). Given these differences, it is hardly surprising that a number of myths have developed about the nature of the research-teaching nexus (Hughes chapter 1).

In this chapter, it is argued that some of the complexity and contested nature of the linkages between research and teaching reflect, firstly, differences in the way that the terms 'research' and 'teaching and learning' are conceptualised; and, secondly, the nature of the disciplinary spaces in which the linkages occurs, that is the environment associated with different disciplinary cultures in which research and teaching take place. In constructing links between research and teaching the discipline is an important mediator (Healey and Jenkins 2003). This is because the conduct of research and the teaching approaches tend to differ between disciplines. This often leads disciplines to act as distinct 'academic tribes' (Becher and Trowler 2001) or 'communities of practice' (Wenger 1998). This chapter explores the disciplinary spaces in which the linkages between research and teaching are developed.

A further theme running through this chapter is that students are likely to gain most benefit from research, in terms of depth of learning and understanding, when they are also involved in research, for example, through various forms of active learning, such as inquiry-based learning (Healey and Roberts 2004). This presents challenges to university staff to reshape curricula and may lead to new ways for staff and students to work together in communities of inquiry, albeit ameliorated by the nature of different disciplinary spaces.

Disciplinary spaces and approaches

For most academic staff, their primary allegiance is to their subject or profession, and their sense of themselves as staff at a given institution is secondary (Diamond and Adam 1995; Healey 2003; Jenkins 1996). There is also a strong perception among staff that there are significant differences among disciplines in what academics do and how those activities are described and valued. There is much supporting evidence for these perceptions. Moses (1990), for example, has demonstrated in a study of four disciplines in an Australian university that attitudes to teaching and research tasks, as well as patterns of communication, vary between disciplines. For example, she found that a significantly higher proportion of staff in Chemistry delivered conference papers and disagreed with the statement that 'When I revise a course I examine teaching and assessment matters to see whether they are appropriate'. The opposite findings characterised Law. Donald (2002), moreover, has shown how different ways of learning occur in different academic disciplines. So, for example, interpretation is emphasised in English Literature in which the meaning of texts is constructed through a hermeneutic process of tacking back and forth between our presumptions and the text. In contrast, in Engineering high regard is given to the development of problem solving skills in which procedures are followed to formulate a problem, do the necessary calculations and verify the logic used to see if the final answer makes sense.

Both Biglan (1973) and Kolb (1984) have distinguished different groups of disciplines. Whereas Biglan focused on how the actors within the disciplines see the characteristics of subject matter in different academic areas, Kolb attended to the predominant learning styles of students. Nevertheless, there is a remarkable consistency between the two classifications and both are used in Becher's work (Becher 1994; Becher and Trowler 2001; Neumann *et al.* 2002). Biglan's contrasts between hard pure (for example, physics), soft pure (for example, history), hard applied (for example, engineering), and soft applied (for example, education) disciplines are used here in preference to Kolb's rather more abstrusely named categories (abstract reflective, concrete reflective, abstract active and concrete active).

Given the importance of disciplines in the self-identity of academics and the learning styles of students, it might be expected that the nature of the research-teaching links varies between disciplines.

Nature of research-teaching links

Most staff, when asked about how their research impacts on teaching, point to the way in which their research findings are integrated into their lecture courses. However, there are many more ways of linking research and teaching than students learning about subject knowledge through lectures. Students may learn about research methods and techniques; they may undertake their own projects, whether individually or in teams; they may assist staff with their research; and they may gain experience of applied research and consultancy through work-based learning (Jenkins *et al.* 2003). Staff may model research-based approaches in the way they teach, through, for example, adopting an inquiry-based learning approach (Elton chapter 6). Staff may also exhibit the scholarship of teaching and learning and investigate the

learning that takes place in their courses, so as to enhance their own teaching (Breslow *et al.* 2004; Cousin *et al.* 2003; Healey 2000). However, undertaking pedagogic research is not discussed further here; rather the focus is on how students may gain from subject-based research in the departments in which they are studying.

Departments and individuals vary in the way that they construct the linkage between research and teaching. It is possible to design curricula, which develop the research-teaching nexus, along three dimensions, according to whether:
- the emphasis is on research content or research processes and problems
- the students are treated as the audience or participants
- the teaching is teacher-focused or student-focused.

Inquiry-based learning, which benefits student learning through direct involvement in research, is towards the right hand end of these three dimensions of curriculum design (Figure 1).

(Figure 1 about here)

A range of terms is used in the literature, often interchangeably, to describe the research-teaching nexus. Griffiths (2004) suggests that a distinction might be made between teaching which is predominantly:
- *Research-led*: where students learn about research findings, the curriculum content is dominated by staff research interests, and information transmission is the main teaching mode;
- *Research-oriented*: where students learn about research processes, the curriculum emphasises as much the processes by which knowledge is produced as learning knowledge that has been achieved, and staff try to engender a research ethos through their teaching;
- *Research-based*: where students learn as researchers, the curriculum is largely designed around inquiry-based activities, and the division of roles between teacher and student is minimised.

Figure 2 illustrates how curriculum design can be linked to the research-teaching nexus. The vertical axis runs from student-focused activities with students as participants to teacher-focused activities with students as the audience, and the horizontal axis stretches from an emphasis on research content to an emphasis on research processes and problems. Research-led teaching is in the bottom left hand quadrant, while research-based teaching is in the top right. Research-oriented teaching occurs in the bottom right. This leaves the top left quadrant, which, although not recognised by Griffiths (2004), is student-focused and emphasises research content. It is perhaps best illustrated by the Oxbridge tutorial system, where students engage in discussion with their tutors producing, in Oxford, an average of three papers or essays a fortnight (Ashwin 2003). 'Research-tutored', although slightly clumsy, might be an appropriate description to put alongside Griffiths' other categories. Interestingly at Oxford the term 'teaching' is not used when referring to tutorials (Gibbs 2004). When tutorials are used inappropriately in order to teach, they have a less positive impact on learning. Trigwell and Ashwin's (2003) research into the learning context at Oxford, shows that when students perceive that their tutorials or small group classes are used for the purpose of teaching, explaining and checking on their knowledge, rather than for collaboratively discussing the subject matter, they are less likely to take a deep approach to their learning and more likely to take a surface approach.

(Figure 2 about here)

Few curricula fit entirely in one quadrant. Although most traditional university teaching takes place in the bottom left quadrant, some disciplines have relatively more activity in the other quadrants. For example, some departments concerned with professional education, such as medicine, engineering and social work, focus their teaching on problem-based learning, a specialised form of inquiry-based learning, which falls predominantly in the top right quadrant of Figure 2. Many more departments engage students in aspects of inquiry-based learning for small parts of their curricula.

Each of the four types of research-teaching relationships can be subdivided further. For example, Barnett (2004) distinguishes six types of research-led teaching according to whether individuals inject current or past research into their teaching and whether that research is, or was, carried out by themselves, others in their department or institution, or elsewhere. The extent to which it is necessary for effective learning that some of the research under discussion is undertaken by the specific teachers, or at least in the same department or university, is critical to the policy debate about the impact of research selectivity. There are similar arguments about the extent to which teachers facilitating research-based or research-tutored learning need to be active or experienced researchers. This, in turn, raises the question of how far the skills of facilitating learning and discovery research are co-located.

The different ways in which the terms 'research' and 'teaching' are used are also key elements in the contested discourse about their linkage (Healey 2005; Scott chapter 12). Griffiths (2004), for example, distinguishes between empirical science, interpretative investigation, and applied inquiry with the first approach being associated particularly with the sciences, the second with the humanities and some of the social sciences, and the third with vocational fields. A decade-and-a-half ago Boyer (1990) argued for a broader definition of research to go beyond, what he called 'discovery scholarship' to include 'applied' and 'integrative' scholarships. According to Colbeck (1998) the broader and more inclusive the definition of what counts as research, the easier it is to integrate it with teaching.

To add to the confusion, the traditional distinctions between research and teaching are becoming blurred with the emergence of 'Mode 2' knowledge production, where the boundaries between discovery research and application are much more messy and integrated, alongside the usual 'Mode 1' disciplinary research generated in universities (Gibbons *et al.* 1994; Scott chapter 12). Jenkins and Zetter (2003: 11) suggest that in a knowledge society

> research is context specific and multidisciplinary rather than pure and discipline based; it has social relevance rather than being hypothesis led; it uses fuzzy, rather than empirically based data; it is problem solving rather than deductive. In what might be termed the commodification of knowledge, how knowledge is managed, synthesised and adapted become as important as knowledge itself.

Teaching, as well as research, is also becoming more heterogeneous. Different approaches to teaching are reflected in different ways of linking with research. Teacher-focused approaches emphasise transmission of research knowledge to a student audience, whereas student-focused approaches emphasise students constructing their own knowledge through active participation in class. It has already

been suggested that learning by doing is an effective way for students to benefit from staff research (Gibbs 1998). This is because active learning is more likely to encourage students to adopt a deep approach to learning, than is the transmission model which may encourage a surface approach (Biggs 2003; Brew and Boud 1995; Prosser and Trigwell 1999). Further evidence comes from the work of Baxter Magolda (1999) and Blakemore and Cousin (2003), who show that students involved in research-based inquiries develop more sophisticated levels of intellectual development. Baxter Magolda sees such research as

> constructive development pedagogy … (in which) teachers model the process of constructing knowledge in their disciplines, teach that process to students, and give students opportunities to practice and become proficient at it (p.9).

Student-focussed approaches are possible in all disciplines, but their application varies between individuals and is affected by departmental and institutional cultures.

Discipline cultures also affect the nature of teaching and learning. Although Gibbs (2000) argues that many methods described as discipline-specific are applied widely across disciplines, he admits that generic principles of learning apply with different balances of emphasis in different disciplines. Neumann *et al.* (2002: 405) go further and suggest that there are many "unremarked similarities and differences" in undergraduate teaching and learning between discipline groups. For example, in the hard pure disciplines they suggest that teaching and learning activities tend to be focused and the emphasis is typically upon the teacher informing the student. Moreover, decisions about teaching content are relatively straightforward and uncontentious and only a limited amount of time is required on course preparation; although where laboratory teaching is used, student contact time is high. In contrast, in the soft pure disciplines, they suggest that teaching and learning activities tend to be largely constructive and interpretive, and that time and care needs to be taken in course preparation. In turn, this preparation comprises a large component of their actual teaching time. Such tendencies in disciplinary differences affect the form of the research-teaching linkage.

Disciplinary spaces and the research-teaching nexus

Just as research can no longer be seen as simply discovering or creating knowledge, and teaching is more than simply transmission of what is already known, there are several different relationships between research and teaching and these vary between disciplinary groups (Colbeck 2004; Robertson and Bond chapter 4). 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. Teamwork also tends to be a more common feature of work in the applied disciplines than in many of the pure ones.

A further factor influencing the nature of research-teaching links is the role of disciplinary and professional associations. These bodies may influence the attitudes of staff and students towards research-teaching links, particularly where they accredit entry into the profession by controlling the curriculum. Webster (2002: 16), for example, refers to professional bodies encouraging "curriculum creep" in response to the growing complexity of practice and the expansion of knowledge. This, he suggests, can lead to a "distancing of teaching and research".

The different disciplinary opportunities to engage in various forms of linking research and teaching may help to explain some of the disciplinary variations in the research-teaching linkage in terms of both staff and student experiences. In an interview study of staff opinions about the mutual influence of research and teaching at Norwegian universities, 67 per cent of academics in humanities, 59 per cent of social scientists, and 47 per cent of natural scientists felt their research had a meaningful impact on their teaching at the undergraduate level (Smeby 1998). This supports the differences between hard and soft disciplines, commented on earlier, in the ease of integrating the latest research findings into teaching. However, in contrast, a pilot workload survey of the time spent by faculty in one university in the United States on activities that integrated teaching and research, found the rank ordering of the discipline groups reversed (humanities 12.9 per cent, social scientists 16.8 per cent, and scientists 18.0 per cent) (Krahenbuhl 1998). These differences in findings need further exploration.

Although an under-researched area, there are indications that the attitudes and motivations of staff and students may vary between disciplines. For example, conflicts may occur in applied subjects between academic and vocational perspectives. In Business Studies in the UK, for example, Harrington and Booth (2003) report tensions over the role and relevance of research methods courses. They found fundamentally conflicting values, commitments and expectations both between academic staff, and between academic staff and students in 'new' universities, as to whether undergraduates should be developing an appreciation of research. Such conflicts are less likely in pure disciplines; although some students in all disciplines, who are primarily extrinsically motivated and uninterested in communication with staff, appear to be indifferent or have negative attitudes towards research (Breen and Lindsay 1999). Interestingly Breen (2002) found that discipline-specific motivation has a significant influence on student performance. She found from a study of 380 students across eight disciplines in one UK university that:

> … student performance is better explained by looking at motivation within the disciplines than across the disciplines because some motivations conflict between the disciplines. For example, students who seek out 'social analytical thinking' activities are likely to perform well in History, but to under-perform in Computing, Geology and Food Science and Nutrition (p.40).

Variations in student experience of research are also apparent within the group of applied disciplines. One study found that whereas 43 per cent of students studying leisure, tourism, hospitality and sport in one university had experience of engaging in practical activities or fieldwork based on research and consultancy projects, only 9 per cent of students studying business had this experience (Healey *et al.* 2003). This

brings us back to the argument about the benefits for students of active engagement with research.

Reshaping the university

This chapter began with recognising that difference has characterised the debate about the relationship between research and teaching. Arguably in the twenty-first century, as student diversity increases and institutional missions diverge, a range of approaches to developing the research-teaching nexus, which are sensitive to disciplinary differences, are required. However, the evidence mentioned earlier supports the view that appropriately designed student-centred approaches foster deep learning. Elton (2001: 43) recognised this when he argued that "student-centred teaching and learning processes are intrinsically favourable towards a positive nexus, while more traditional teaching methods may at best lead to a positive nexus for the most able students." This suggests that, although the balance and form might vary, a greater emphasis on engaging students actively with research would enhance research-teaching links and benefit student learning across *all* types of higher education institution. In other words, there is a case for reshaping universities to place greater emphasis on pedagogies which fall in the top half of Figure 2.

One type of active learning which focuses on student direct engagement with research is inquiry-based learning, which refers to forms of learning driven by a process of inquiry. Badley (2002: 451) argues for "seeing both research and teaching as different forms of inquiry". Recently several authors have called for developing research-teaching linkages in communities of inquiry in which staff and students are 'co-learners' (Le Heron *et al*. 2004) in the process of academic inquiry. Brew (2003: 16) argues that such communities are for all students and are not limited to high-flyers or elite institutions. She sees them as "a key to the future for a mass higher education system."

Robertson and Bond (chapter 4: p?) suggest that higher education consists of "multiple intersecting communities of inquiry". Differences between communities are to be expected where they are organised around disciplines for the reasons discussed earlier. Academics also vary as to when they perceive it is an appropriate time for students to be engaged in their disciplinary community. Robertson and Bond found that in the hard disciplines many academics believe that students need to acquire a sufficient basic knowledge before they can contribute. This may restrict the opportunities for undergraduate students to take part in their communities until near the completion of their courses. In contrast, in the soft disciplines they found that academics anticipate that students will occupy a more participative role in their disciplinary community from the beginning.

The idea of inquiry-based learning is not a new one. For example, towards the end of the 19th Century, Kropotkin (1885: 944) advocated replacing the rote learning method of teaching geography with independent inquiry and discovery-based problem solving. He noted from his own experience "the rapidity of teaching on the 'problems' method is something really astonishing." Subsequently Stenhouse (1975) argued, in the context of the school curriculum, for an approach to learning and teaching that mimics as closely as possible the actual pattern of inquiry in the discipline being learnt. Much inquiry-based learning draws on ideas from experiential learning theory. Which

examines how "knowledge is created through the transformation of experience" (Kolb 1984: 38). Inquiry-based learning provides opportunities for students to engage with a range of different learning experiences and styles, even though disciplines may have preferred learning styles (Healey and Jenkins 2000; Healey *et al.* 2005).

A few institutions are largely organised around inquiry-based learning. For example, at Hampshire College, Amherst, Massachusetts there is a whole institution focus on active inquiry, while at Roskilde University, Denmark, 50 per cent of the curriculum is based around group projects (Jenkins *et al.*, 2003: 83-85). More commonly elements of inquiry-based learning are integrated into programmes, such as through the undergraduate research movement in the United States (Kinkead 2003). Specific discipline examples include, geography at Salford University, where the 'Project' took a third of contact hours in years one and two (Hindle, 1993); and Arts of Citizenship at the University of Michigan, which develops courses in which students combine learning and research with practical projects that enhance community life (Arts of Citizenship 2004).

Although there is much theoretical support for inquiry-based learning, Colbeck (2004: 10) claims that of the various ways that research and teaching may be linked, inquiry-based learning, in the form of problem-based learning (PBL), is the only one

> for which there is systematic empirical evidence of student learning gains. Meta-analyses of the effects of PBL on medical students' learning found that PBL students gained less content knowledge (although they remember what they have learned longer), but gain more in skills and perform more effectively on clinical examinations than students receiving traditional lecture-style instruction.

Discussion and Conclusion

This chapter has explored the disciplinary spaces within which the relationships between teaching and research occur. Three arguments have interweaved the chapter. Firstly, it was suggested that some of the controversy about the research-teaching nexus is due to differences in the way the terms 'research' and 'teaching and learning' are used. Generally it is easier to develop the linkages the more acceptable it is to use the terms flexibly to include a wider range of forms. A four-fold typology of different kinds of relationship was suggested based on the extent to which learning is student or teacher-focused and the extent to which emphasis is placed on research content or research processes and problems. Secondly, it was argued that disciplines are important for the way in which staff and students experience the research-teaching nexus. Although for some, the boundaries between disciplines are becoming less important, particularly with the growth of interdisciplinarity and Mode 2 knowledge production (Brew 2001), this chapter has indicated that, at least at the level of broad disciplinary groups, there are differences apparent in the way in which research and teaching tends to be conducted. These, in turn, influence the opportunities available for staff and students to link research and teaching (LTSN 2004). Thirdly, it was suggested that research-based learning structured around inquiry is one of the most effective ways for students to benefit from the research that occurs in departments. The nature of the inquiry is, in turn, influenced by the disciplinary space in which it is set.

Discipline is, of course, only one factor influencing variability in research-teaching links; others include national context, academic context (institutional type, and departmental practices), and individual characteristics (motivations, skills and dispositions). Each of these influences the disciplinary effects on teaching and research relationships (Colbeck 2004).

Most of the international research on linking research and teaching is generic; this chapter has reviewed those pieces which have a specific disciplinary focus. There are wide gaps in this literature. More systematic research is needed into the disciplinary differences (and similarities) in the way linkages are and can be constructed. Some of these studies should be comparative; others should involve detailed case studies within specific disciplines. Identifying the variation in practice *within* disciplines is just as important as analysing the differences *between* disciplines. Exploring and developing the disciplinary spaces in which research and teaching may be linked should be a priority.

Much current practice as to ways of linking research and teaching reflects tradition, but there is considerable variability in approaches *within* subjects. Inquiry-based learning, for example, may be infrequent in some disciplines, and occur at different stages of the curriculum in different disciplines. However, innovation is possible, as is shown by examples such as, inquiry-based learning in English 18th century poetry at the University of Manchester (Hutchings and O'Rourke 2001), and the use of research based assignments in the introductory Biosciences course taken by over 450 students at Rutgers, The State University of New Jersey (Devanas 2001).

The Boyer Commission on Educating Undergraduates in the Research University (1999) suggests that research-based learning should be standard and that it should begin with inquiry-based learning in year 1 and end with a 'capstone' experience based around a major project. For their recommendations to be implemented significant changes in the ways of working and in the power relationships between staff and students would be necessary. More modest shifts in practice, through for example converting selected core modules at different levels in the curriculum, would be a sensible way for many departments to start to explore the benefits of inquiry-based learning and for staff and students to gain experience of working with this form of active learning. Staff and departments will need support in making these changes (Elton chapter 6). Accompanying these changes it would be essential that systematic research into the impacts of the introduction of inquiry-based learning is undertaken.

Badley (2002: 455) concluded that:

> Most I imagine will continue … to see teaching's role as the safer transmission of what is currently thought to be known. However, … for the purpose of academic *freedom*, of pedagogical *variety* and of student *growth* towards autonomy, a really useful (and much more stimulating) approach is to regard research and teaching as two different, but overlapping processes of inquiry.

There are many pressures that are pulling research and teaching apart. Barnett (2003: 157), for example, states that "The twentieth century saw the university change from a site in which teaching and research stood in a reasonably comfortable relationship with each other to one in which they became mutually antagonistic". Putting greater emphasis on actively engaging students with research, suitably

adapted to recognise the variation and complexity of constructing knowledge in different disciplines, is one way of re-linking them in the twenty-first century.

References

Arts of Citizenship (2004) Program statement. Available at: www.artsofcitizenship.umich.edu/about/program.html accessed 13 August 2004.

Ashwin, P. (2003) Variation in students' experiences of small group tutorials, in C. Rust (ed.) *Improving Student Learning: Theory and Practice - 10 Years On.* Oxford: Oxford Centre for Staff and Learning Development, Oxford Brookes University.

Badley, G. (2002) A really useful link between teaching and research, *Teaching in Higher Education*, 7(4): 443-55.

Barnett, R. (2000) *Realizing the University in an Age of Supercomplexity.* Buckingham: SRHE and Open University Press.

Barnett, R. (2003) *Beyond all Reason: Living with Ideology in the University*. Buckingham: SRHE and Open University Press.

Barnett, R. (2004) personal communication, 14 August.

Baxter Magolda, M. B. (1999) *Creating Contexts for Learning and Self-Authorship.* Nashville, Tennessee: Vanderbilt University Press.

Becher, T. (1994) The significance of disciplinary differences, *Studies in Higher Education*, 19(2): 151-61.

Becher, T. and Trowler, P. (2001) *Academic Tribes and Territories: Intellectual Enquiry and the Cultures of Disciplines*. 2nd edn. Buckingham: SRHE and Open University Press.

Biggs, J. (2003) *Teaching for Quality Learning at University: What the Student Does.* 2nd edn. Buckingham: SRHE and Open University Press.

Biglan, A. (1973) The characteristics of subject matter in different scientific areas, *Journal of Applied Psychology*, 57(3): 195-203.

Blackmore, P. and Cousin, G. (2003) Linking teaching and research through research-based learning, *Educational Developments*, 4(4): 24–7.

Boyer, E. L. (1990) *Scholarship Revisited*. Princeton University NJ: Carnegie Foundation for the Advancement of Teaching.

The Boyer Commission on Educating Undergraduates in the Research University (1998) *Reinventing Undergraduate Education: A blueprint for America's research universities*, Stony Brook: State University of New York at Stony Brook. Available at naples.cc.sunysb.edu/Pres/boyer.nsf/ accessed 15 August 2004.

Breen, R. (2002) Different disciplines require different motivations fro student success, *Teaching Forum*, 50 Autumn: 39-40. Available at: www.brookes.ac.uk/virtual/NewTF/50/tf50contents.htm accessed 18 August 2004.

Breen, R. and Lindsay, R. (1999) Academic research and student motivation, *Studies in Higher Education,* 24(1): 75-93.

Breslow L., Drew L., Healey M., Matthew B. and Norton L. (2004) Intellectual curiosity: a catalyst for the scholarships of teaching and learning and educational development, in E.M. Elvidge (ed.) *Exploring Academic Development in Higher Education: Issues of Engagement.* Cambridge: Jill Rogers Associates.

Brew, A. (2001) *The Nature of Research: Inquiry in Academic Contexts*. London: Routledge Falmer.

Brew, A. (2003) Teaching and research: new relationships and their implications for inquiry-based teaching and learning in higher education, *Higher Education Research and Development,* 22(1): 3-18.

Brew, A. and Boud, D. (1995) Teaching and research: establishing the vital link with learning, *Higher Education,* 29: 261-173.

Colbeck, C. L. (1998) Merging in a seamless blend, *The Journal of Higher Education,* 69(6): 647-71.

Colbeck, C. L. (2004) A cybernetic systems model of teaching and research production: impact of disciplinary differences, paper presented at *Research and Teaching: Closing the*

Divide? An International Colloquium, Marwell Conference Centre, Winchester, 17-19 March. Available at: www.solent.ac.uk/r&t_conference accessed 13 August 2004.

Cousin, G., Healey, M., Jenkins, A., Bradbeer, J., King, H., and other members of the Learning to Do Pedagogic Research Group (2003a) Raising educational research capacity: a discipline-based approach, in C. Rust (ed.) *Improving Student Learning: Theory and Practice - 10 Years On.* Oxford: Oxford Centre for Staff and Learning Development, Oxford Brookes University.

Devanas, M. (2001) Biomedical issues of HIV/AIDS, Science Education for New Civic Engagements and Responsibilities Model Series 2001. Available at: http://www.aacu-edu.org/SENCER/pdfs/Models_Print_Web_2004/HIV_Model.pdf accessed 13 August 2004.

Diamond, R. M. and Adam, B. A. (eds) (1995) *The Disciplines Speak: Rewarding the Scholarly, Professional, and Creative work of Faculty.* Washington: American Association for Higher Education.

Donald, J. G. (2002) *Learning to Think: Disciplinary Perspectives.* San Francisco: Jossey Bass.

Elton, L. (2001) Research and teaching: what are the real relationships? *Teaching in Higher Education,* 6(1): 43-56.

Gibbons, M., Limoges, C., Nowotny, H., Schwartzman, S., Scott, P. and Throw, M. (1994) *The New Production of Knowledge.* London: Sage.

Gibbs, G. (1988) *Learning by Doing: A Guide to Teaching and Learning Methods.* London: Further Education Unit. Available at: www.glos.ac.uk/gdn/gibbs/index.htm accessed 13 August 2004.

Gibbs, G. (2000) Are the pedagogies of the discipline really different?, in C. Rust (ed.) *Proceedings of the 1999 7th International Symposium Improving Student Learning: Improving Student Learning Through the Discipline.* Oxford: Oxford Centre for Staff and Learning Development, Oxford Brookes University.

Gibbs, G. (2004) personal communication, 16 August.

Griffiths, R. (2004) Knowledge production and the research-teaching nexus: the case of the built environment disciplines, *Studies in Higher Education,* 29(6), 709-726.

Harrington, J. and Booth, C. (2003) Rigour versus relevance, research versus teaching? Evidence from business and management studies. Paper presented to *Society for Research into Higher Education Annual Conference: Research, Scholarship and Teaching: changing relationships?* 16-18 December 2003, Royal Holloway, University of London.

Hattie, J. and Marsh, H. W. (1996) The relationship between research and teaching: A meta-analysis, *Review of Educational Research* 66(4): 507-42.

Healey, M. (2000) Developing the scholarship of teaching in higher education: A discipline based approach, *Higher Education Research and Development,* 19(2): 169-89.

Healey, M. (2003) The scholarship of teaching: issues around an evolving concept, *Journal on Excellence in College Teaching,* 14(1/2): 5-26.

Healey, M. (2005) Linking research and teaching to benefit student learning, *Journal of Geography in Higher Education,* 29(1) (forthcoming).

Healey, M. and Jenkins, A. (2000) Learning cycles and learning styles: the application of Kolb's experiential learning model in higher education, *Journal of Geography* 99, 185-95.

Healey, M. and Jenkins, A. (2003) Discipline-based educational development, in R. Macdonald and H. Eggins, (eds) *The Scholarship of Academic Development.* Buckingham: SRHE and Open University Press.

Healey, M., Jordan, F., Pell, B. and Short, C. (2003) The student experience of research and consultancy, SEDA-Society for Research into Higher Educational Joint Conference on *The Scholarship of Academic and Staff Development: Research, Evaluation and Changing Practice*, Bristol, 9-11 April 2003.

Healey, M., Kneale, P., Bradbeer, J. with other members of the INLT Learning Styles and Concepts Group (2005) Learning styles among geography undergraduates: An international comparison, *Area*, 36(1) (forthcoming).

Healey, M. and Roberts, J. (eds) (2004) *Engaging Students in Active Learning: Case studies in geography, environment and related disciplines.* Cheltenham: Geography Discipline Network and School of Environment, University of Gloucestershire.

Henkel, M. (2000) *Academic Identities and Policy Change in Higher Education*. London: Jessica Kingsley.

Hindle, B. P. (1993) The 'Project': putting student-controlled, small-group work and transferable skills at the core of a geography course, *Journal of Geography in Higher Education,* 17(1): 11-20.

Hutchings, W. and O'Rourke, K. (2001) Introducing enquiry-based teaching methods in literary studies, in *Critical Encounters: Scholarly Approaches to Learning & Teaching*, Continuing Professional Development Series 6. York: Higher Education Academy. Available at: http://www.heacademy.ac.uk/profdev/case_study6.pdf accessed May 2005.

Jenkins, A. (1996) Discipline-based educational development. *The International Journal for Academic Development*, 1(1): 50-62.

Jenkins, A. (2004) *A guide to the research evidence on teaching-research relationships.* York: Higher Education Academy.

Jenkins, A., Breen, R., and Lindsay, R. with Brew, A. (2003) *Re-shaping Higher Education: Linking Teaching and Research*. London: SEDA and Routledge.

Jenkins, A. and Zetter, R. (2003) *Linking Research and Teaching in Departments*. York: LTSN Generic Centre. Available at: www.ltsn.ac.uk/application.asp?app=resources.asp&process=full_record&section=generic&id=257 accessed 13 August 2004.

Krahenbuhl, G. S. (1998) Faculty work: Integrating responsibilities and institutional needs, *Change,* 30(6): 18-25.

Kinkead, J. (ed.) (2003) *Valuing and Supporting Undergraduate Research: New Directions for Teaching and Learning 93*, San Francisco: Jossey Bass.

Kolb D. A. (1984) *Experiential Learning: Experience as a Source of Learning and Development*. New York: Prentice Hall.

Kropotkin, P. (1885) What geography ought to be, *The Nineteenth Century*, 18: 940-56.

Lee, R. (2004) Research and teaching: making – or breaking – the links, *Planet,* 12: 9-10.

Le Heron, R. and the Linking Research & Teaching Group (2004) Geography as a site of co-learning: re-linking research and teaching. Available at: www.gees.ac.uk/iguevent.htm#olps accessed 15 August 2004.

LTSN (2004) *Linking Research and Teaching.* Available at: www.ltsn.ac.uk/genericcentre/index.asp?id=17235 accessed 13 August 2004.

Neumann, R., Parry, S. and Becher, T. (2002) Teaching and learning in their disciplinary context. *Studies in Higher Education*, 27: 405-17.

Pocklington, T. and Tupper, A, (2002) *No Places to Learn: Why universities aren't working*. Vancouver: University of British Columbia Press

Prosser, M. and Trigwell, K. (1999) *Understanding Learning and Teaching: The experience of higher education*. Buckingham: SRHE and Open University Press.

Smeby, J-C. (1998) Knowledge production and knowledge transmission. The interaction between research and teaching at universities, *Teaching in Higher Education, 3*(1): 5-20.

Stenhouse, L. (1975) *An Introduction to Curriculum Research and Design* London: Heinemann.

Trigwell, K. and Ashwin, P. (2003) *Undergraduate Students' Experience of Learning at the University of Oxford*. Oxford: University of Oxford, Institute for the Advancement of University Learning. Available at: http://www.learning.ox.ac.uk/iaul/IAUL+3+7.asp accessed 17 August 2004.

Webster C. (2002) Constructing the teaching-research link in the built environment disciplines, *Exchange*, 3: 15-16.

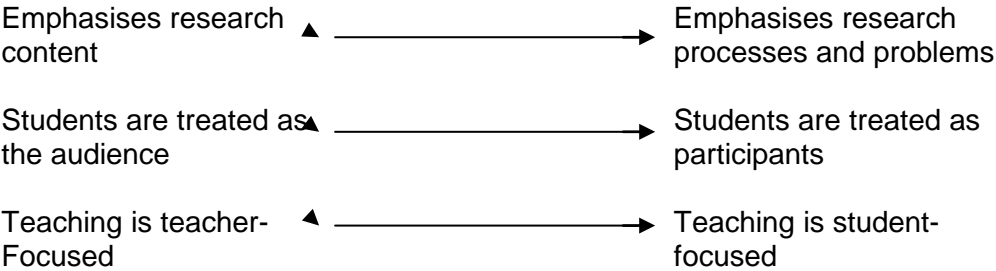Wenger, E. (1998) *Communities of Practice: Learning, Meaning and Identity*. Cambridge: Cambridge University Press.

Emphasises research content ◢ ——————————————▶ Emphasises research processes and problems

Students are treated as◢ ——————————————▶ Students are treated as the audience participants

Teaching is teacher- ◀ ——————————————▶ Teaching is student-Focused focused

Figure 1: Three dimensions of curriculum design

STUDENT-FOCUSED

STUDENTS AS PARTICIPANTS

Research-tutored	**Research-based**
Curriculum emphasises learning focused on students writing and discussing papers or essays	*Curriculum emphasises students undertaking inquiry-based learning*
Research-led	**Research-oriented**
Curriculum is structured around teaching subject content	*Curriculum emphasises teaching processes of knowledge construction in the subject*

EMPHASIS ON RESEARCH CONTENT

EMPHASIS ON RESEARCH PROCESSES AND PROBLEMS
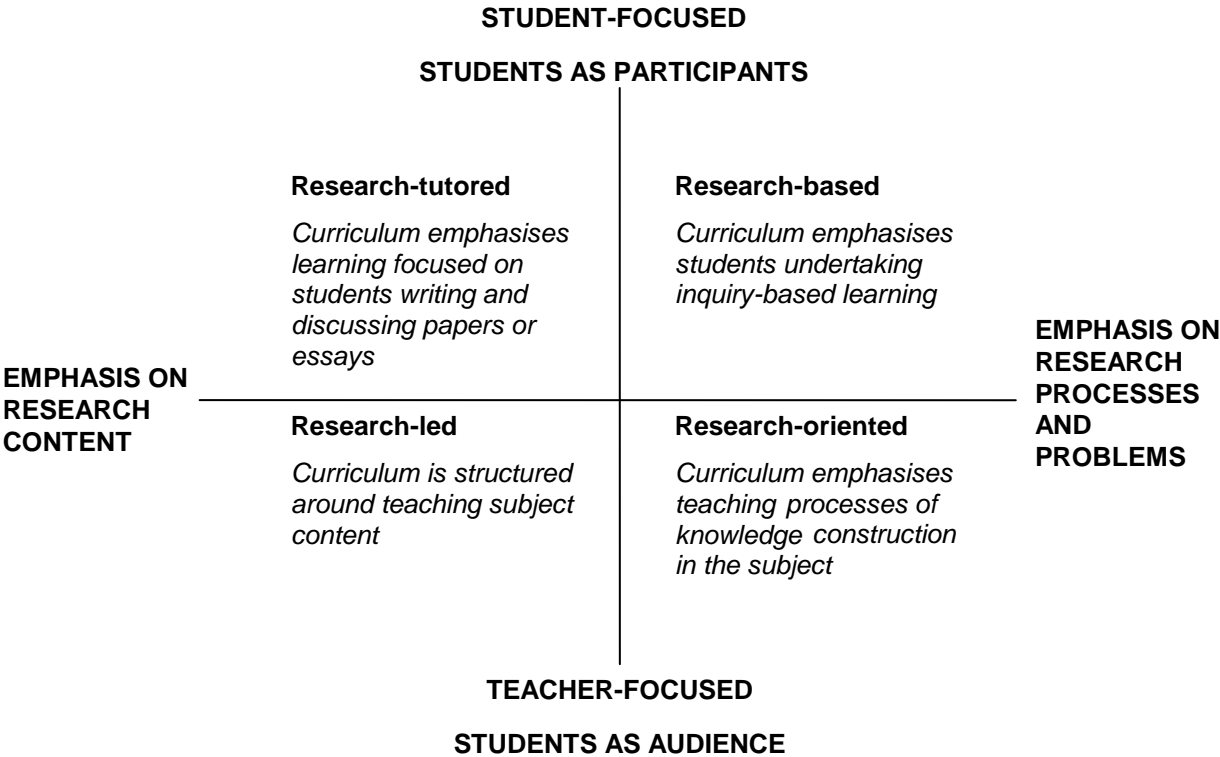
TEACHER-FOCUSED

STUDENTS AS AUDIENCE

Figure 2: Curriculum design and the research-teaching nexus

Words: c6,050

Professor Mick Healey, University of Gloucestershire, is the Director of the Geography Discipline Network and Senior Advisor for Geography at the Higher Education Academy's Subject Centre for Geography, Earth and Environmental Sciences Subject Centre. He was awarded a National Teaching Fellowship in 2000. His research interests include the scholarship of teaching and learning, research-teaching linkages, active learning, and the learning experiences of disabled students.

Professor Mick Healey
School of Environment
University of Gloucestershire
Francis Close Hall
Swindon Road
Cheltenham GL50 4AZ
UK

Tel: Office: 01242 543364; Home: 01432 870713
Email: mhealey@glos.ac.uk