The myth of the research-led teacher

Ian M. Kinchin* and David B. Hay

King’s College London, UK

This paper examines the contention that achievement in research is a prerequisite for effective teaching in higher education. It also explores university level teaching more generally with the purpose of examining the links between teaching and research. Concept mapping, in particular, is described as a means of exploring both the knowledge structures of experts (teachers and researchers) and the cognitive changes that are indicative of meaningful learning among students. We use the approach to suggest that rich and complex networks are indicative of expert status, but that these are seldom made explicit to students in the course of teaching. Instead, simple, linear structures comprise most lesson plans or teaching sequences. This linearity is often made transparent through the lecturers’ use of PowerPoint presentations to structure teaching. Thus the transmission mode of teaching predominates in HE and evidence of authentic research-led teaching remains scant. This is likely to reinforce surface learning outcomes among university students and be an impediment to the emergence of expert status. The linear chains that are commonly espoused in teaching lend themselves to rote learning strategies rather than to individual meaning making. The approach we describe here has the potential to reinstate expert status as the prime qualification for teaching in higher education. Where concept mapping is used to share and explore knowledge structures between students and experts, then learning can be shown to occur in ways that are synonymous with research and discovery. Using this approach, the teacher–student distinction becomes legitimately blurred so that the sharing and advancement of knowledge are concomitant. In conclusion, we suggest that this is a basis for a pedagogy that is appropriate to HE and distinct from the compulsory sector.

Keywords: Concept mapping; Pedagogy of access; Research–teaching nexus; University teaching

Introduction

University teaching has been accused of being dominated by a whole-class, teacher-centred, non-interactive mode of lecturing (Bodner et al., 1997), that is the antithesis of the model widely promoted in the current higher education teaching and learning

*Corresponding author. King’s Institute of Learning and Teaching, King’s College London, James Clerk Maxwell Building, 57 Waterloo Road, London SE1 8WA, UK. Email: ian.kinchin@kcl.ac.uk

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literature (see Prosser & Trigwell, 1999; Nicholls, 2002; Biggs, 2003; Ramsden, 2003). This is a generalization, and we acknowledge that university teaching is exemplified by a range of epistemological stances. We also acknowledge that university teaching consists of more than just lecturing (e.g., seminars, tutorials, lab practicals, etc), but there is no evidence to suggest that non-lecture teaching sessions are governed by different basic philosophies. Even though seminars may offer greater scope for student interaction and feedback, the notion of ‘teacher-as-expert within a transmission mode of teaching’ still prevails. Such a view of teaching and learning within higher education has been maintained by a powerful ‘mythology of unexamined beliefs’ and taken-for-granted assumptions about how academics can control their students’ learning (Louie et al., 2002). Such myths persist as they serve specific interests, ‘such as administrative convenience and the dominant cultures of academic departments; and they provide excellent excuses for not doing anything much to make teaching better’ (Ramsden, 2003, p. 86).

Recruitment of new academic staff within higher education is often undertaken on the premise that excellent researchers within a given discipline will by implication be better teachers. This view is contested by Hattie and Marsh (1996) who conducted a meta-analysis of 58 studies and concluded that the common belief that research and teaching are inextricably entwined is an enduring myth. The relationship between teaching and research is often described as if it is something that can be easily quantified and catalogued as a single entity—a nexus. It is more likely to be described effectively as a complex, multifaceted construct. Neumann (1992, 1996) has found the nexus to be operating at three levels: tangible, intangible and global. Much of the literature looks at the global level, reflecting a managerial/accountability perspective and consists of quantitative measures of correlations between teaching and research performance indicators (e.g., student evaluation scores and the number of journal articles accepted for publication). The work described here, links with what Neumann described as the intangible nexus. This relates to the development in students of their attitudes towards knowledge whilst providing a stimulating environment for academics.

There is evidence to suggest that lecturers who are involved in research are perceived as ‘credible’ with ‘enhanced knowledge currency’ by their students (Lindsay et al., 2002). However, in a recent study of academics’ perceptions of teaching in higher education, the comment was made that the teaching–research nexus seemed ‘patchy’ (Kinchin, 2005), with some staff casting doubt on the relationship between the two activities and on the likelihood of a single lecturer excelling at both:

There is a big push, isn’t there, that good researchers are good teachers. Some are. I don’t think there are many of those around – who can do both. You end up getting to the lofty heights of lectureship and then you start doing some lecturing on the basis of a very strong research background. It doesn’t mean that you are a good lecturer at all. (Kinchin, 2005)

Mapping knowledge frameworks

So why might accomplished researchers have difficulty teaching within their field of expertise? Qamar uz Zaman (2004) lists a number of arguments presented in the
literature to support a negative relationship between quality in research and teaching, including time, personality characteristics, curriculum distortion. None of these factors focus on knowledge structures and the ways in which the teacher will conceptualize materials in the contexts of teaching and research.

The theoretical view described here is presented from a synthesis of our reflections on studies that we have conducted over the past eight years in which we have examined large numbers of concept maps (supported by questionnaire and interview data) from teachers and their students at various stages in their higher education careers (undergraduate and postgraduate). Methodological details of those studies can be found in the references cited here. Those studies have involved the production of concept maps by several hundred students, including secondary school students, undergraduates, postgraduates, schoolteachers and university lecturers. Some of the students were followed through an academic year to see how their understanding had changed and were supplemented by interviews to elicit the deeper meaning of their maps. This work was carried out within a number of academic disciplines. That work has been augmented over the past two years by numerous teaching observations of colleagues within a university teaching environment and who were registered for a postgraduate teaching qualification and by the tutorials that have supported these observations.

A study of perspectives held by subject expert novice teachers has suggested that they find difficulty in restructuring their expert knowledge frameworks to make them more accessible to their students (Kinchin & Alias, 2005). This has been described by constructing concept maps of staff and student knowledge frameworks—classified qualitatively according to their morphology, as ‘spoke’, ‘chain’ or ‘net’, according to the scheme devised by Kinchin et al. (2000). These three basic morphological types are indicative of different stages in the development of understanding. The novice is typified by the spoke structure that indicates a readiness to incorporate new ideas. The chain structure suggests a degree of goal orientation as the learner constructs the simplest structure that can connect basic ideas in an easily memorized format. The net structure provides more integration of the ideas involved and so is indicative of greater expertise. The structural difference between spokes, chains and nets can be seen by looking at the concrete examples shown in Figure 2 of this article, portraying the same information in each of the three morphological types (expert = net; teaching = chain; student = spoke). Achievement of teaching aims and learning objectives often require more skills and greater knowledge than is recognized by the novice teacher who adopts a goal-orientated, content-centred approach, exemplified by a chain structure. Consideration of alternative perspectives (through reflection upon alternative spoke and net concept map structures) helps the teacher to recognize this mismatch and restructure teaching accordingly (Kinchin & Alias, 2005).

**Concept mapping**

The concept map is a product of 25 years of research and development focusing on helping students learn how to learn. This work has been spearheaded by Joseph
Novak and his colleagues at Cornell University (see Novak & Gowin, 1984; Novak, 1998). Concept mapping builds explicitly on Ausubel’s assimilation theory of meaningful learning (Ausubel, 2000) and fits well with constructivist learning perspectives (Trowbridge & Wandersee, 1998). It provides a tool to support reflection, helping to transform implicit associations to make explicit linkages (Fisher, 2000), and as such is a valuable tool in the armory of novice teachers who may be encouraged to reflect upon their teaching to enable them to justify their classroom approach.

The mechanics of creating concept maps can be introduced to students and teachers at any stage of their academic careers, and is often presented with simple rules for construction that ensure some commonality of style to facilitate comparison of maps by different authors (see White & Gunstone, 1992). Concept mapping can be used as a vehicle for introducing the ideas of student-centred teaching and constructive alignment (as discussed by Biggs, 2003) to novice teachers in a non-threatening manner that respects constructive principles (see Shymansky, 1992; Kroll & LaBosskey, 1996; Richardson, 1997). In this way, concept mapping activities can be seen as a tool for the professional development of teachers. If, as stated by Caine and Caine (1994), the fundamental task of the teacher is to facilitate the self-organization of the student, then the teacher needs to be aware of the multiplicity of starting points that may exist among a cohort of students. Such awareness may be supported by examining the possible structural variation of concept maps that may be produced to portray material to be taught. This puts teachers in the position of active innovators in their own teaching (Martin, 1994). Appreciation of these multiple perspectives may also help the teacher to consider his/her teaching strategy in relation to his/her own learning strategy and reflect upon ways to compensate for bias in any given direction (Rayner & Riding, 1997; Huai, 2000).

In terms of teachers’ professional development, the concept mapping approach described here helps the novice to go beyond mastery of content and how best it can be transmitted, towards an appreciation of pedagogy and how understanding can be variously constructed by students. It provides a concrete, practical tool that relates directly to the everyday operation of their classrooms—seen as essential if it is to be attractive to teachers and become part of their practice over the long term (Fullan & Miles, 1992).

**Lecturers’ expert knowledge frameworks**

Expertise can be defined by the way in which an individual constructs his/her knowledge framework within a particular domain with such structures made explicit through the use of concept maps (Novak & Gowin, 1984; Kinchin, 2001). Characteristics of expertise as illustrated by concept maps are summarized in Table 1.

Teachers in higher education will have developed and refined their expert knowledge structures over several years, evolving slowly to accommodate new research within the field. Such expertise is highly prized within universities and lecturers are often appointed on the basis of their expertise, lending weight to the prestige of the department. However, expertise within an academic discipline does not necessarily
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The complex relationship between teaching and research has been written about extensively (see Qamar uz Zaman (2004) for a review of this literature), and so will not be repeated here. Whilst university teachers are aware that their own understanding may grow slowly through their research and engagement in the discourse of a discipline, students are expected to grasp an understanding of the materials presented to them in lectures much more quickly. This mismatch between teachers’ conceptions of their own learning and their conceptions of student learning has long been recognized in the literature. Holt summarized it in his comment:

“We teachers … are in the grip of an astonishing delusion. We think we can take a picture, a structure, a working model of something, constructed in our minds out of long experience and familiarity, and by turning that model into a string of words, transplant it whole into the mind of someone else. (Holt, 1967, p. 164)

The transmission mode of teaching described above by Holt, and criticized as the dominant teaching paradigm within higher education (see Bodner et al., 1997) has been challenged in recent years. As the focus of higher education changes from

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Table 1. A comparison of key characteristics observed in expert and novice concept maps

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Expert maps</th>
<th>Novice maps</th>
</tr>
</thead>
<tbody>
<tr>
<td>Connectedness</td>
<td>Highly integrated structure with numerous cross-links.</td>
<td>Disjointed structure dominated by linear arrangements of isolated clusters.</td>
</tr>
<tr>
<td>Link quality</td>
<td>Appropriate linking phrases which add to the meaning of concepts, using the specialist language of the discipline.</td>
<td>Links are often inappropriate. Usually single words that add little to the meaning and using non-specialist terminology.</td>
</tr>
<tr>
<td>Link variety</td>
<td>A diversity of linking phrases illustrating a range of thought processes.</td>
<td>The same linking words are used for a number of links, suggestive of a narrow range of thought processes.</td>
</tr>
<tr>
<td>Dynamism</td>
<td>Change slowly over time by evolution, reflecting active interaction with alternative knowledge structures.</td>
<td>May be stable over time where the student is not engaged in knowledge restructuring. May change radically (by revolution) when the student’s view has been challenged and replaced with a more viable worldview.</td>
</tr>
<tr>
<td>Orientation</td>
<td>Concentration on major overarching concepts to create an overview. Major concepts are placed above minor concepts.</td>
<td>Concentration on specific concepts creating a narrow perspective at the expense of a wider view as personal familiarity with concepts is ranked above their global significance. Minor concepts are often placed above major concepts.</td>
</tr>
<tr>
<td>Morphology</td>
<td>Network structure (indicative of integrated understanding and flexible/multiple interpretations).</td>
<td>Spoke structure (indicative of learning readiness) or chain structure (indicative of existing preconceptions).</td>
</tr>
</tbody>
</table>

Sources: Kinchin (2000, 2001); Kinchin et al. (2000); Hay and Kinchin (2005).
teaching to learning (see Ellington, 2000), teaching has been promoted as a form of scholarship to be viewed alongside research (Nicholls, 2005). So what additional skills do lecturers need to acquire if their teaching is to be as accomplished as their research?

**From researcher to teacher**

One of the keys to a good researcher becoming a good teacher is an understanding of the significance of pedagogical content knowledge (Shulman, 1986). This idea has been developed over the past twenty years and has recently been reconceptualized as ‘teacher pedagogical constructions’ by Hashweh (2005). These constructions may be viewed as a set of attributes that helps the teacher to share their knowledge of content with others (Geddis, 1993). It is important to acknowledge that the students’ final constructions may not be exact replicas of the teacher’s expert view, but should share sufficient attributes to allow a meaningful discourse between the two. Gudmundsdottir et al. (1995) have described how pedagogical content knowledge is often invisible to teachers as it is usually tied up in automatic routines. The explicit transformations described below provide a mechanism to help make the invisible, visible, helping teachers to reflect upon and revise their automatic routines.

Teachers differ from researchers, not necessarily in the quantity of their subject matter knowledge, but in how that knowledge is organized and used (Cochran, 1992). An experienced teacher’s knowledge is organized from the learners’ perspective and is used as a basis for helping students to understand specific concepts. However, a researcher’s knowledge is organized from a research perspective and is used as a basis for developing new knowledge in the field. For those teachers in higher education who have to oscillate repeatedly between the roles of teacher and researcher (Harland & Plangger, 2004), an explicit tool to support this contextual switching may help to structure both activities in such a way that each supports the other.

**Transformation for teaching**

Concept mapping is the tool that is used here as it has been shown to have a dual role as a device that can both promote and assess conceptual change in a higher education setting (see Gravett & Swart, 1997). Concept mapping attempts to mirror the cognitive frameworks held by students or teachers in a given domain in order to gain insight into their understanding (Edwards & Fraser, 1983).

Learners have been shown to modify the structure of their concept maps as their understanding of a topic develops. Such structural development cannot be described as a simple linear progression as it is influenced by numerous factors, including the student’s starting point; assessment methods and student motivation (Hay & Kinchin, 2005). Consideration of variations in possible knowledge structures has been shown to be beneficial to novice teachers in higher education as it helps them to appreciate the multiple perspectives held by students and to reflect upon how the
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A teacher should transform their expert knowledge in a way that will support student learning most effectively (Kinchin & Alias, 2005).

Whilst the novice teacher may cover the same content as an expert colleague, content-centred transformations (usually linear in nature, corresponding to chain-type concept maps) do not promote subject expertise. The linear teaching approach keeps the student at a distance as an observer of the discourse of the discipline as it is passed before him/her, rather than as a participant engaged in its construction (Northedge, 2003). The chain thinker has been described as goal-orientated by Hay and Kinchin (2005), who consider the chain knowledge structure to be indicative of a surface approach (e.g., memorization for an exam composed of atomized questions requiring simple recall of information).

For the success of the expert transformation for teaching, selection of appropriate concepts is crucial. Whether these are considered as anchoring conceptions (Clement et al., 1989) or threshold concepts (Meyer & Land, 2003) they will provide students with a gateway into the academic discourse. Students will often take their cues for the structure of a module from the first lectures in the series (Kinchin et al., 2005). If these are not the ideas that the lecturer sees as the guiding principles of the course, they may introduce a barrier to effective dialogue about the course as a whole and the students may simply miss the big ideas that are being addressed in subsequent lectures.

The chain-type framework is difficult to interact with and so is only helpful if the aim of the teaching is to support rote learning and memorization of information (reflecting a transmission view of teaching). The spoke-type framework provides a more fertile base upon which to add concepts and develop ideas for the construction of personal understanding, and has been described as indicative of being learning-ready by Hay and Kinchin (2005). The problem of moving from linear (often text-based) structures to hierarchical (psychological) structures and back again has been described by Novak and Symington (1982) as a fundamental educational problem. Unless these structures are made explicit, the problem remains hidden and the classroom issues that result from this remain unresolved.

In this way it may be seen that the change from novice to expert transformations (Figure 1) is likely to parallel an epistemological development within the teacher, from objectivist to constructivist (Davis et al., 1993; Elby & Hammer, 2001). Nicholls (2005, p. 84) describes how objectivism creates a distance between the teacher and student that could form the basis for lack of real engagement and understanding of such concepts as teaching and learning. Only when this distance is broken down can the teacher really engage with the student through the medium of the discipline (rather than engaging with the discipline and being observed by the student).

Martin (1994) has shown that teaching in schools tends to project a linear, compartmentalized perspective of knowledge that contributes to the problem highlighted by Novak and Symington (1982). In their wide-ranging study of the transition from secondary to tertiary education, Pargetter et al. (1998) concluded that studying and learning approaches at tertiary level appear to be strongly influenced
by practices at secondary school level and a mismatch may create problems. For school students to think that all they can do is to observe linear knowledge structures and attempt to memorize them for examinations may be viewed as a disabling epistemological belief (as described by Schoenfeld, 1983) when those students transfer to higher education and are then expected to display creative, independent thought.

When students are engaged in learning, the knowledge frameworks they hold will interact with the knowledge frameworks projected through their teachers’ words and actions. The degree of interaction has been shown to be influenced by the overall structure of the frameworks, with some structural interactions being more helpful than others. Chain–chain interactions seem to be the least productive in terms of developing new insight (Kinchin & Hay, 2005) as this type of knowledge framework is difficult to restructure and may be indicative of an intentional neglect of information (Hay & Kinchin, 2005). Therefore, if the teacher is projecting a chain structure through his/her teaching and the student also holds a chain structure, this provides a worst case scenario in which meaningful learning is made difficult to achieve. Martin (1994) has shown that teaching frequently concentrates on one sequence of ideas after another, without demonstrating the links between sequences. When then asked to produce concept maps of the ideas covered, students tend to produce maps exhibiting a dominantly linear arrangement. Increasing the tendency towards linearity, Bligh (2000) considers chaining as a method to help sequence material presented in a lecture without considering a possible loss of integration of ideas as a possible consequence. Linear sequencing may also be amplified by an overdependence upon the use of PowerPoint presentations to support lectures (Tufte, 2003). Such transformations have been described as *PowerPointlessness* by Ward (2003) who sees such presentations as a mechanism to promote passivity among students, helping to render invisible the prior learning and experience that students were bringing to their class. In combination, these factors would seem to make chain-chain interactions a likely event within the higher education arena.

The expert knowledge structure (held by the teacher/lecturer) cannot simply be transferred to the student as a complete package. When an academic has gained a Ph.D. within a discipline and possibly then spent several further years researching within a field, it would be unreasonable to expect a group of undergraduates to catch up with this level of understanding within a one-hour teaching session. Therefore, material has to be transformed and repackaged into a suitable format for delivery (typically as a lecture). Such transformation is described by Shulman (1987) as a key pedagogical reasoning skill. The nature of this transformation is critical to the success of the lecture and indicates the degree of understanding that the lecturer has of the learning challenge presented to the students. Certain transformations may be characteristic of novice teachers (and suggestive of a focus on content), whilst others are more indicative of expert teachers (suggestive of a focus on students) (Figure 1). The relative importance of the object of teaching (the learners and their needs) is taken as an indicator of teaching expertise (Pratt, 1992; Wood, 2000).
Transformation for learning

Shambaugh (1995) asserts that true knowledge and understanding can be developed in the learner and by the learner through the transformation of fragmented, compartmentalized knowledge into knowledge of personalized meanings. The development and sharing of personalized meanings is a goal of the approach to teaching and learning embodied within human constructivism (sensu Mintzes et al., 1997), outlined in three key assertions:

(a) Human beings are meaning-makers. From a very early age, the human brain endeavours to construct order from apparent chaos. The desire to form
meaningful patterns is considered by some authors to be an innate characteristic in which emotion, personal relevance and context are seen as contributing factors.

(b) The goal of education is the construction of shared meanings. This allows a community of learners (students and teachers) to exchange ideas within a common framework of understanding.

(c) Shared meanings may be facilitated by the active intervention of well-prepared teachers. Such preparedness refers not only to subject expertise, but also to an appreciation of the students’ perspectives on the world.

Appropriate transformations of knowledge structures offer a mechanism to open a teacher–student dialogue that can facilitate these assertions, though less appropriate transformations may provide more of an impediment.

**Unproductive cycles and productive cycles**

The typical transformation sequence for a lecture in higher education would consist of the expert structure being simplified and rearranged into a linear format for delivery. This is illustrated in Figure 2 for a teaching sequence on microbiology. The linearity imposed in the material for teaching may result in the illusion of false hierarchies as the teaching sequence may depend upon numerous practical issues, some of which lay outside the structure of an individual lecture.

Students then have a choice of whether or not to engage with the material. Those who opt out of engagement may just try to memorize the linear structure (i.e., there is no student transformation of the material). Those who do engage with the materials and actively try to reconstruct their own personalized meanings will take their cues from the knowledge structure projected during teaching. As PowerPoint is the preferred tool used by many lecturers to provide visual support for lectures, the knowledge structure is often made visible through a sequence of PowerPoint slides. Such a sequence tends to promote a linear knowledge structure that may reveal part of the lecturer’s expert understanding (Hay *et al.*, 2005; Kinchin, 2006). Such linearity may lead to a misinterpretation of the hierarchy of ideas—students typically taking the first ideas to be presented as those which determine the structure of the whole discipline, as has been demonstrated within the life sciences (Pearsall *et al.*, 1997; Kinchin *et al.*, 2005).

The PowerPoint structure is poor at demonstrating the integrated nature of the material (Kinchin, 2006) and so the student transformation may well lack the cross-linkages that contribute to the recognition of expertise (Table 1). The emerging student structure may well eventually lead towards the development of expertise, but the structural mismatch between the student structure and the expert structure suggests that time is required for reflection and restructuring. The short time frames of many higher education modules may result in the student being assessed during the restructuring process, manifesting itself as a dip in performance (as predicted by Schuell, 1990). Such an experience may result in the student opting out of engagement.
in future, reverting to the less risky strategy of memorization. This would effectively discourage the development of expertise.

Consideration of how to increase the productivity of the transformation cycle leads to the modification depicted in Figure 3.

The difference between the productive and unproductive cycles is concerned with the nature of the transformation for student learning and the support this is given. Without guidance, students tend to use the first ideas presented as the organizing principle for their developing knowledge structures. A poorly constructed hierarchy may lead to the development of a novice structure that exhibits a mismatch with the teacher’s view that is likely to impede the development of expertise.

The productive cycle is likely to reduce the length of the performance dip and so increases the likelihood that the student will have started to construct an understanding that reflects the expert structure (in part or in whole) before it is formally assessed, thereby promoting more meaningful learning within the practical constraints that exist within the university structure.
Implications for teacher development

In terms of teacher development within higher education, we would suggest that is not sufficient to simply strengthen the teacher’s expert knowledge framework, within which the teacher/researcher will be working, as anticipated by some academics: ‘I’ll get better by being more knowledgeable about my subject—spend more time in the library’ (quoted in Kinchin, 2005), but it is necessary to engage with the students and gain a deeper insight into their emerging knowledge frameworks so that teaching can target the teacher–student overlap and guide the student towards a more expert perspective (Kinchin, 2003). The academic quoted above appears to believe that consolidation and elaboration of an expert knowledge framework will help develop a more effective teaching approach. This is the myth to which s/he is committed. But however comprehensive the teacher’s expert knowledge framework, unless it is transformed appropriately to support dialogue with the novice student, it will not help student learning and will emphasize the gap between teaching and research. It is reflection upon the transformation process, and how teachers can engage with it, which will help student learning.
For subject experts to reconceptualize their status as pedagogical novices, it requires doing without ‘the confidence in one’s own power that arises from sovereignty in an area’ (Cropley, 2001, p. 94). The colleague quoted above who then retreats to the library therefore, seems to be engaged in displacement activity, focusing on the familiar and the non-threatening. This can be interpreted as a form of passive resistance to change (as described by Lasley et al., 1998). Those colleagues who are more vocal in their resistance to change in the status quo of university teaching will conjure elegant arguments to support their stance. The perceived trump card to be played by many change resistant lecturers is to describe any attempt to engage atypical undergraduates in the discourse of the discipline by the restructuring of materials as dumbing down. This could not be further from reality. The challenge these colleagues seem keen to avoid is the cognitive load that the restructuring of materials places upon the teacher to access and interact with student knowledge frameworks. This is analogous to the cognitive load that has been traditionally placed solely on the shoulders of the students. The assumption that what was transmitted was correct so that any errors are down to the faulty student reception, absolves the teacher from any responsibility to reconsider the message transmitted. A philosophical shift from teaching as transmission to learning as construction, tests this assumption to destruction.

Models of professional development that target specific aspects of academic work in isolation have been criticized for continuing to support the divide between teaching and research (Reid & Petocz, 2003). By looking at the relationship between teaching and research through concept mapping of knowledge structures, the ideas proposed in this article would help to satisfy Reid and Petocz’s call for a focus on the synergies between research and teaching rather than the distinctions between them. The rigor applied to disciplinary research also needs to be applied to teaching and learning in higher education.

The ideas outlined above would be a step towards the development of a pedagogy of access as described by Hendricks and Quinn (2000), by structuring teaching in a way that invites student engagement from a variety of starting points. Implicit in this approach is the recognition of the value of a sophisticated epistemology as described by Elby and Hammer (2001), in which the chosen position has to be not only philosophically sound, but also fit for purpose. Clearly there is more to effective teaching than simply projecting the appropriate knowledge framework, but this may provide a good foundation for the further development of the professional teacher, described by Darling-Hammond (1999), as one who continually learns from the practice of teaching rather than one who has finished learning how to teach. We would argue that real teacher-expertise is displayed by the ability to oscillate between nets, spokes and chains, according to the context and learning demands of the students (see Figure 4).

The expert teacher is one who is aware of the multiple perspectives of knowledge within a class and can exploit that diversity within his/her teaching. This provides support for the novice student to build upon his/her learning readiness by opening a dialogue. Explicit consideration of the model depicted in Figure 4 may help the
novice teacher to appreciate the difficulties s/he may be creating for their students simply by projecting a knowledge structure that is not supporting students learning and failing to provoke academic discourse. The same knowledge may be restructured in such a way that it supports effective dialogue and meaningful learning.

To maintain expertise, it is not enough for the expert teacher to identify what works and stick with it. As the teaching milieu changes and evolves, so too must the expert’s appreciation of what works. This ability to adapt separates the established teacher from the expert teacher. The established teacher may exhibit selective inattentiveness to data that would upset current ways of looking at things, maintaining the myth of the stable state (see Schön, 1971). The expert teacher modifies the projected teaching framework by reflecting upon the underlying, dynamic framework that may be invisible to the student (i.e., acknowledging the inherent instability in the system). The relationship between the projected framework and the underlying expertise is illustrated in Figure 5.

The necessity of modifying the projected structure even when the underlying framework remains unchanged, may represent a threshold concept for teaching expertise. A dynamic relationship between two unstable structures (‘the current state of research’ and ‘the current teaching milieu’) requires a continual focus on teaching and its development and may help to clarify for academics what the scholarship of teaching might look like in practical terms and remove the current confusion over the issue, as described by Nicholls (2005).

The relationship between teaching and research may be dependent upon a philosophical match between the two. Whether a teacher conceptualizes research in terms
of personal change (as described by Brew, 2003) or in terms of measurable outputs (publications) may influence the way in which that view resonates with the teacher’s view of teaching, as acquisition of facts or as changes in understanding. Where ‘change’ is the common focus, it may be considered as a unifying concept that may help the academic to reconcile the teaching–research nexus.

Conclusions

Whether one considers the concept of the research-led teacher to be a myth or a reality depends upon the conceptions of teaching and of research that are activated and
the possibilities for interaction between the two. Where an academic considers teaching and research from a products perspective, then interaction between them will be problematic. Relationships will be difficult to construct between teaching and research. Without recognizing the unifying concept of change, the value of the teaching–research nexus will not be apparent. When teaching and research are seen more from a process perspective (within a constructivist framework), then personal change can be perceived to be a major goal of each activity. Such a standpoint allows the academic to relate the two activities and appreciate the scholarship of both (Nicholls, 2005). Where mismatches between the two may exist and be identified (Figure 6), it may give teacher educators an indication of the nature of their role as belief-and-attitude therapists (as described by Boote, 2003).

Reflection on academic practice needs to be more than navel-gazing if university lecturers are to cope with changes in higher education over the coming years. The interaction between research and teaching needs to be continually re-examined from multiple perspectives, and particularly from the perspective of the students in whom we are encouraging the development of expertise. To support colleagues in developing their professional identity as academics, they must be guided to take a wider view of academic practice, and not confine themselves to being exclusively a researcher or a teacher. Academia must embrace both with equal rigour and professionalism.

Notes on contributors

Ian M. Kinchin is a senior lecturer within King’s Institute of Learning and Teaching, King’s College London. He teaches on a postgraduate certificate course in university teaching and his research interests are concerned with the development of an authentic pedagogy for higher education with a particular focus on the application of concept mapping techniques.

David B. Hay is a senior lecturer within King’s Institute of Learning and Teaching, King’s College London. He teaches on a postgraduate certificate course in university teaching and his research interests are concerned with the development of an authentic pedagogy for higher education with a particular focus on the application of concept mapping techniques.

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