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A Knowledge Structures Perspective on the Scholarship of Teaching & Learning

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The application of concept mapping to university teaching has revealed the significance of knowledge structures in the process of student learning. The method highlights the negative influence of linearity in promoting an environment where non-learning is the norm. A possible antidote to non-learning is suggested through the reconsideration of the role of uncertainty in higher education and a reconceptualisation of the notion of the expert teacher.

Keywords
Knowledge structures, Scholarship of teaching and learning

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The application of concept mapping to university teaching has revealed the significance of knowledge structures in the process of student learning. The method highlights the negative influence of linearity in promoting an environment where non-learning is the norm. A possible antidote to non-learning is suggested through the reconsideration of the role of uncertainty in higher education and a reconceptualisation of the notion of the expert teacher.

Introduction

It has been stated that '*one of the overriding purposes of the scholarship of teaching is to make more visible what teachers do to make learning happen*' (Trigwell and Shale, 2004). This visualisation has been explored through the application of concept mapping techniques (Novak, 1998) that have been used to reveal the quality of an individual's understanding, and even to make the tacit explicit (Hoffman and Lintern, 2006). The qualitative analysis of concept maps considers their morphology in addition to the content held within the map, and has revealed the repeated occurrence of three main morphological types, referred to as spokes, nets and chains (Kinchin, Hay and Adams, 2000). Further analysis of the significance of these structures has revealed characteristics that have implications for teaching and learning within higher education that go far beyond the typical consideration of concept maps as a tool to facilitate study-skills development. Concept mapping has provided a trigger for the development of a scholarly, student-engaged pedagogy (Kinchin, Lygo-Baker and Hay, 2008), based on the visualisation of expertise (Kinchin, Cabot and Hay, 2008). One of the benefits of using concept mapping in the development of pedagogy is that it is a 'theory-embedded tool', embodying the philosophy of constructivism in which understanding is viewed as a network of interconnected ideas rather than isolated information. This is a point that may be crucial in developing the scholarship of teaching as it is considered by Sherborne (2009) that there is more likelihood that 'a learning philosophy will survive the transformation into classroom experience if developers use a tool that embeds the paradigm'.

Linearity in Teaching

Direct observation of university teaching shows that the dominant knowledge structures to be found presented in lectures are the bulleted lists that are so characteristic of PowerPoint slides (Kinchin, Chadha and Kokotailo, 2008). Such a delivery mode represents an economy of performance (i.e., it is quick and 'efficient' and supports the student strategy of collecting enough of the appropriate information to pass the exam). This situation is described by Kinchin, Lygo-Baker and Hay (2008) as supporting a cycle of non-learning: an approach that ignores the ecology of practice with the disciplines, does not support student participation, and runs contrary to views of learning that acknowledge students as active partners:

> *To learn is to participate in and contribute to the*
> *evolution of the communal practice.*
>
> Keiny (2002: 208)

The linear presentation of materials denies the student access to the ways of thinking within a discipline, hiding the lecturer's expertise and maintaining the separation of teaching and research (Kinchin, 2008). In short, it keeps the undergraduate at arms length – as a perpetual novice (Lea, 2005). The thought processes that have led to the construction of linear teaching materials are often hidden so that much of the mental effort required mastering the discipline has been done already for the student:

> *Just because the order is logical, it represents the survey of subject*
> *matter made by one who already understands it, not the path of*
> *progress followed by a mind that is learning. The former may*
> *describe a uniform straight-way course; the latter must be a series*
> *of tacks, zig-zag movements back and forth.*
>
> Dewey (1910: 204)

If teachers feed their students a knowledge diet made exclusively of chains that are to be regurgitated later for assessment (i.e., a 'trade in chains' that has been described by Kinchin, Lygo-Baker and Hay (2008) as a 'cycle of non-learning') there are serious implications for educational research. For example, it might not seem appropriate to conduct research into students' learning styles within an environment dedicated to promoting non-learning (Kinchin, 2009). Findings would need to be re-framed into a non-learning context, though investigations into students' non-learning styles might be seen in a negative light by the academy.

Personal Models of Teaching: Chains and Networks

The linear representation of material in lectures seems to reflect a similar structure inherent in many university teachers' personal models of teaching, and suggests a way of viewing the separation of teaching and research (e.g. Kinchin, Hatzipanagos and Turner, 2009). The alignment of teaching with a more research-appropriate stance requires that teaching not only reflects the research within the discipline in terms of content to be covered, but also in approach to teaching. In particular, the uncertainty that is inherent in research has to be modelled in the teaching of the discipline if the student is to learn to think like an academic, so that teaching can '*foster student experiences that mirror the lecturers' experiences of research*', (Barnett, 2000: 163). In order to investigate the relationship between knowledge structures and conceptions of teaching, new faculty engaged upon a postgraduate certificate in higher education teaching at King's College London were asked to construct concept maps to portray their personal models of teaching. The resulting structures exhibited a number of morphological types and included various teaching-related concepts: some concentrating upon the teacher's actions, some upon classroom strategies and others with more of a focus on student learning. Two extreme models are depicted in Figure 1:
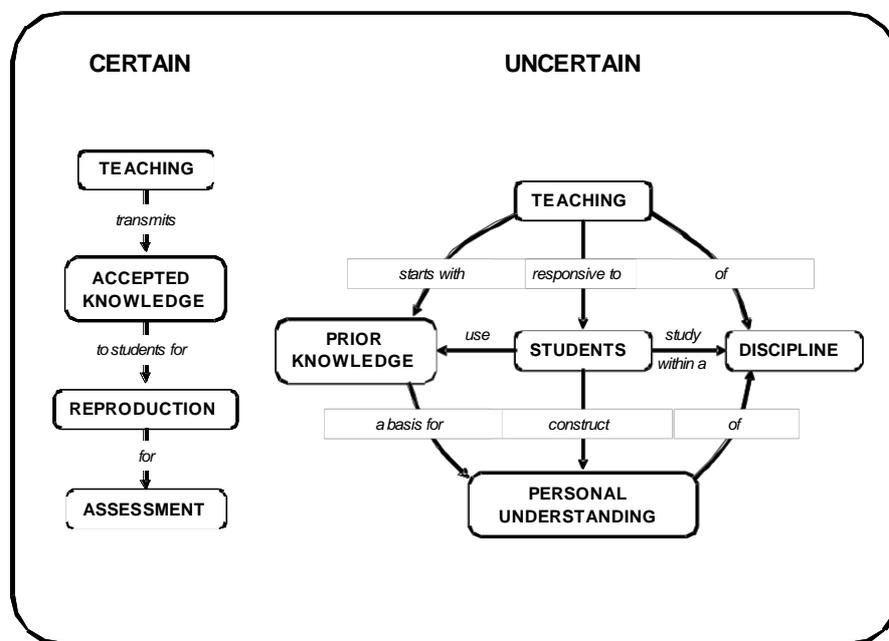
Figure 1. The linear model of teaching promotes a naïve, false certainty about the process, while the network structure accommodates more uncertainty within the system – depicted as two exemplars drawn as indicative composites of typical components from a range of participants' responses.

The chain is indicative of strategic success (i.e. "*It works for me*") in which the participant selects what is considered the essential information to convey his/her view of teaching and selectively ignores the rest. The competence that is indicated by chains has been described as a 'monolayer of understanding' by Talbot (2004), in which dialogue plays no part in its development; i.e. it portrays an authoritarian certainty that has only a single possible route from beginning to end. Adoption of a chain model of teaching (as portrayed in Fig. 1) may indicate a survival strategy for inexperienced university lecturers that they consider a 'safe system' to adopt (Canning, 2007). The attractiveness of this model is easy to see: the boundaries are clear and the roles and responsibilities for student and teacher are easy to define. However, the structure leaves no room for development through engagement with students, such as those described by van Heerden (2005: 95):

> *I learned how to think like a chemist through nine years of education and three research positions. I thought about what that means though, only when I became a teacher. My discovery of how chemists think has evolved largely because of my interactions with students. I have come to believe that this discovery is absolutely critical for effective teaching; it has impacted upon my courses, my relationships with students, my pedagogical approaches, and my assessments of students' performances.*

The network structure depicted in Figure 1 represents a model that is more likely to facilitate the teacher-student interactions described by van Heerden. The network

includes more sources of uncertainty than the chain (eg. the nature of students' prior knowledge) that require teacher-student dialogue for a satisfactory resolution to be achieved. The uncertainty may also be seen as a driver for further inquiry (eg. Hall, 2002), that may lead to a more scholarly approach to teaching. The network includes a variety of routes through the structure that has no clear end point.

A move from 'accepted knowledge' (in the chain structure) to 'personal understanding' (in the network structure) requires a parallel shift in perspective from one that regards students as consumers of knowledge to one that regards students as producers of knowledge (e.g. Gamache, 2002). The comments in the network structure are also starting to edge towards revealing glimpses of the moral and ethical purpose of teaching that many teachers hold (Fitzmaurice, 2008).

The 'chain' morphology of the left-hand model is indicative of goal orientation whilst the 'network' morphology of the right hand model is more accepting of a pluralist stance that can tolerate some difference between the personal understanding developed by students and the teacher's understanding of the discipline. The links within the 'chain' arrangement are indicative of certainty – what is transmitted is agreed, and what is acceptable from the students as assessment is also laid down as the 'accepted knowledge' that is transmitted. Within the 'network' arrangement, the links are not so prescriptive – 'starts with' and 'a basis for' are not predictive of a particular trajectory of change.

The Expert Teacher

In order to find a way of managing the conflicting demands placed upon university teachers, it may be helpful to conceptualise the issue by thinking that the 'expert' teacher has to reconcile the tensions between the 'chain of certainty' that relates to traditional assessment regimes and the hegemony of the audit culture that prevails within universities, with the 'network of uncertainty' that relates to the personal learning trajectories of students and the social values that are inherent in the disciplines. This means that evaluation of teaching needs to refer to the teacher's ability to navigate between chains and nets rather than to refine one or the other – reflecting Norman's (2005) assertion that '*expertise lies in the availability of multiple representations of knowledge*'. If the chain structure persists as a teacher's personal model of teaching, even after years of experience, there would seem little opportunity for a more scholarly stance to emerge and 'academic development' would be perceived to have little relevance to practice. The perpetuation of an unreflective chain of practice in teaching will lead to routinization and automation of procedures that might be considered as indicators of 'mindless activity' (Langer, 1989). The chain structure may be indicative of a premature commitment to an early understanding of teaching that lacks the sophistication that can be achieved by ongoing reflective practice and a consideration of underlying concepts (ie. a pedagogic framework). Mindlessness can be induced when there is an undue focus on outcomes and a dependency on rote learning. This has been described by Kinchin, Lygo-Baker and Hay (2008), as indicative of the university as a 'centre of non-learning'.

Smith (2001) stated that '*faculty must develop their own expertise in helping students learn before they can help students develop expertise*'. This can be interpreted through a knowledge structures perspective, and can be reformulated as, *faculty must develop their own ability to manipulate knowledge structures before they can help students to develop that ability.* This is an ongoing dynamic development of teaching that will never reach a stable endpoint, summed up by Yielder (2004: 64):

> *One of the critical features of their [teachers'] expertise .. is the way in which they are continuously making sense, or meaning, out of their experiences in order that they can make modifications that actively meet and manage change.*

The knowledge structures perspective offered here provides a mechanism that can support the visualisation of this process and help faculty to communicate with each other (and with students) as they navigate the route towards scholarship in teaching.

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