

## Threshold concepts and troublesome knowledge (2): Epistemological considerations and a conceptual framework for teaching and learning

JAN H.F. MEYER<sup>1</sup> & RAY LAND<sup>2\*</sup>

<sup>1</sup>Centre for Learning, Teaching and Research in Higher Education, University of Durham, United Kingdom; <sup>2</sup>Centre for Higher Education Development, Coventry University, United Kingdom (\*E-mail: ray.land@coventry.ac.uk)

**Abstract.** The present study builds on earlier work by Meyer and Land (2003) which introduced the generative notion of *threshold concepts* within (and across) disciplines, in the sense of transforming the internal view of subject matter or part thereof. In this earlier work such concepts were further linked to forms of knowledge that are ‘troublesome’, after the work of Perkins (1999). It was argued that these twinned sets of ideas may define critical moments of irreversible conceptual transformation in the educational experiences of learners, and their teachers. The present study aims (a) to examine the extent to which such phenomena can be located within personal understandings of discipline-specific epistemological discourses, (b) to develop more extensively notions of *liminality* within learning that were raised in the first paper, and (c) to propose a conceptual framework within which teachers may advance their own reflective practice.

**Keywords:** Threshold concepts, troublesome knowledge, identity, liminality, mimicry, pre-liminal variation.

### Introduction – threshold concepts revisited

Earlier work (Meyer and Land 2003) introduced the basic idea that in certain disciplines there are ‘conceptual gateways’ or ‘portals’ that lead to a previously inaccessible, and initially perhaps ‘troublesome’, way of thinking about something. A new way of understanding, interpreting, or viewing something may thus emerge – a transformed internal view of subject matter, subject landscape, or even world view. In attempting to characterise such conceptual gateways it was suggested in the earlier work that they may be *transformative* (occasioning a significant shift in the perception of a subject), *irreversible* (unlikely to be forgotten, or unlearned only through considerable effort), and *integrative* (exposing the previously hidden interrelatedness of something). In addition they

may also be *troublesome* and/or they may lead to troublesome knowledge for a variety of reasons.

In conversation with professional colleagues 'threshold concepts' have found an immediate appeal as being a 'pedagogically fertile' and energising topic to consider. Proposed examples are usually immediately forthcoming: *precedent* in Law, *depreciation* in Accounting, *the central limit theorem* in Statistics, *entropy* in Physics, and so on. In more detail, for example, a professor of Physiology in a London medical school describes the way that an understanding of 'pain', as a threshold concept, serves to transform the professional thinking and discourse of medical undergraduates. From earlier understandings and accounts of pain as something negative, to be removed or diminished, the clinical practitioner learns to 'see' or read pain differently, as an ally that aids diagnosis and healing. Within literary studies a troublesome notion that has long been reported is that of irony. As one lecturer put it, 'Initially, they just don't get it, but once they realise what irony is and how it is used by writers, whole areas open up, and perceptions, in terms of the various layers of meaning and structure that might be operating within a work at one time. But it's a hard concept to teach.'

It was suggested further that the new 'conceptual space' opened up by such transfigured thought is in turn *bounded*, possessing terminal frontiers, bordering with thresholds into new conceptual spaces. The determination of such boundaries, however, immediately raises questions relating to hierarchy and relations of power within learning environments and academic communities more widely – issues to which we shall return.

### **Threshold concepts, language and transformation of identity**

It is hard to imagine any shift in perspective that is not simultaneously accompanied by (or occasioned through) an extension of the student's use of language. Through this elaboration of discourse new thinking is brought into being, expressed, reflected upon and communicated. This extension of language might be acquired, for example, from that in use within a specific discipline, language community or community of practice, or it might, of course, be self-generated. It might involve natural language, formal language or symbolic language.

We would argue further that as students acquire threshold concepts, and extend their use of language in relation to these concepts, there occurs also a shift in the learner's subjectivity, a repositioning of the self.

This might have powerful effects as, for example, when first year students of Cultural Studies report their recognition of the implications of the concept of 'hegemony' for the ways in which their personal choices and behaviour might be culturally constrained, determined or gendered. Alternatively this *reconstitutive* effect of threshold concepts might entail a less discernible, cumulative process of skill acquisition, as when a mature student of French, patiently struggling to understand the use of the subjunctive mood, reports nonetheless a sense of slowly increasing confidence in her emerging identity as a speaker of French. Educational developers who provide accreditation programmes for academics in higher education report the troublesome nature of 'reflection' for academic colleagues, such as engineers, who hold quite different understandings of scientific knowledge and who initially find the now well-established discourse of professional reflection both alien, inaccessible and unnecessary, though a facility with such discourse is increasingly deemed *de rigueur* by various quality regimes. From the learner's perspective there is an unwelcome power relation deemed to be in operation in which one academic tribe is seen imperialistically to be colonising the discursive space of other tribes.

What is being emphasised here is the inter-relatedness of the learner's identity with thinking and language. Threshold concepts lead not only to transformed thought but to a transfiguration of identity and adoption of an extended discourse.

### **Liminal space**

It is worth reflecting further at this point on the nature of the conceptual spaces entered and occupied by higher education students during their programmes of learning. For students who find the learning of certain concepts difficult or troublesome we have characterised such spaces as akin to states of 'liminality' (Meyer and Land 2003). This notion is drawn from the seminal ethnographical studies conducted by van Gennep (1960) and Turner (1969) into central social rituals, such as rites of passage associated with the initiation of adolescent boys into manhood amongst traditional peoples. Turner adopted the term 'liminality' (from Latin *limen*, 'boundary or threshold') to characterise the transitional space/time within which the rites were conducted.

These ethnographical examples relate primarily to liminality in life cycles. The important aspect of looking at other cultures is that it is

easier to make objective generalisations. The concept of the 'betwixt and between' liminal state then becomes easy to recognise in contemporary western culture – think, for instance, of the wedding ceremony where the 'threshold' ceremony is followed by a 'liminal' honeymoon. Think, too, of funerary ceremonies where the period from death to inhumation (or cremation) is equally 'liminal'. (Trubshaw 2003)

The comparison is useful for our purposes for a number of reasons. First the rituals or states of liminality which Turner analyses tend to be transformative in function, and usually involve an individual or group being altered from one state into another. Second as a result of the ritual the participating individual acquires new knowledge and subsequently a new status and identity within the community. This transition however is often problematic, troubling, and frequently involves the humbling of the participant. 'In order to do so, he or she must strip away, or have stripped from them, the old identity. The period in which the individual is naked of self – neither fully in one category or another – is the liminal state' (Goethe 2003). Third the transformation can be protracted, over considerable periods of time, and involve *oscillation* between states, often with temporary regression to earlier status. Adolescence, for example, as an identified liminal state within modern Western cultures, often involves oscillation between states of childhood and adulthood. Adolescence may be a protracted liminal state and may involve behaviours which approximate to adulthood but constitute for a given period a form of *mimicry* of the new status. It would appear too that within liminal states the new status (e.g., adulthood, first-time motherhood, manhood) is anticipated simultaneously both with desire and apprehension. It would appear however, that once the state of liminality is entered, though there may be temporary regression, there can be no ultimate full return to the pre-liminal state.

... the villagers agree with the Mbuti that the crux of such rites is that one becomes something or someone else. Whether that transformation is reversible or not is another issue; it would seem that in some cultures at least there is a technique of reversal that can be learned, or may be inherited. As far as I could understand it from the Bira and the Mbuti, and from my own limited experience, in one sense for them it is irreversible, unless by further subsequent transformation... Transformation of this kind is what they see as taking place in what we call the medial state; liminality itself is then the process of transformation at work. The technique of consciously

achieving transformation is the process of entering the liminal state. (Turnbull 1990, p. 79)

Within educational settings it would appear that, on the part of the learner, there may be inability to achieve the new (transformed) status, occasioning a similar form of 'mimicry' or entry into what Ellsworth (1997) calls 'stuck places'. But there would seem to be no re-winding of the transformative process. It is tempting to equate such mimicry with the 'surface approaches' to learning identified by Entwistle (1981) and commentators working within the phenomenographic tradition (Ramsden 1988; Marton et al. 1997). Mimicry, however, seems to involve both attempts at understanding *and* troubled misunderstanding, or limited understanding, and is not merely intention to reproduce information in a given form. We will return to this issue below.

### **Conceptual difficulty**

In the light of these observations, liminality, we argue, can provide a useful metaphor in aiding our understanding of the conceptual transformations students undergo, or find difficulty and anxiety in undergoing, particularly in relation to notions of being 'stuck'. Stuck places may occasion difficulty by presenting 'epistemological obstacles' (Brousseau 1983, 1997) that block any transformed perspective. The task for course developers and designers here is to identify, through constructive feedback, the source of these epistemological obstacles, and subsequently to free up the blocked spaces. This might be achieved, for example, by redesigning activities and sequences, through scaffolding, recursiveness, provision of support materials and technologies or new conceptual tools, through mentoring or peer collaboration, or through provision of a 'holding environment' (Winnicott 1971) to enable the necessary shift in perspective that might permit further personal development. The way in which chess players talk of 'developing' a piece involves the removal of other pieces (obstacles) so as to free up the (multiple) ways in which the piece might now be able to move. For a more detailed discussion of the implications of threshold concepts and troublesome knowledge for course design and evaluation see Land et al. (2005).

There are occasions, of course, when the troublesome nature of knowledge might prove beneficial. An interesting variant on our understanding of troublesome knowledge might be derived from the

discipline of Economics. Siegfried and Sanderson (1998, p. 167) in discussing the use of sports to teach Economics suggest that, from a student learning perspective, the *creation* of (in this case counter-intuitive) troublesome knowledge can have a positive effect. Such knowledge can assist students to appreciate the importance of certain economic phenomena, and, in so doing, to foreground how economists ‘think’:

Although the existence of multiple equilibria is probably the most disconcerting characteristic of games for veteran economists, the *absence* of counterintuitive results often creates a mental obstacle for the rookie student. Because of their experience with sports, many students believe that they ‘know how to play the game’. Producing counterintuitive results in this context is persuasive evidence that there is something useful to learn from a serious study of economics. A simple exercise with a mixed strategy equilibrium game demonstrates the importance of taking indirect effects into account, *which is a key element of ‘thinking like an economist’*. (Emphasis added.)

On the other hand the stuck places encountered by students – particularly those within the humanities and social sciences (Cousin 2003) – can have an ontological dimension. Ellsworth (1989, 1997) has warned against tendencies in pedagogy towards the disembodiment and genericisation of the learner that disregard affective and social dimensions to her subjectivity. She encourages her own teacher education students towards:

... cultivating a third ear that listens not for what a student knows (discrete packages of knowledge) but for the terms that shape a student’s knowledge, her not knowing, her forgetting, her circles of stuck places and resistances. (1997, p. 71)

This obviously renders problematic any simplistic schematic attempt to overcome troublesome knowledge by technicist redesign of curricula alone, and challenges easy assumptions that if the learning environment is suitably ordered and ‘constructively aligned’ (Biggs 1999) then the intended transformations will ensue. In a critique of Critical Pedagogy she argued that the latter’s humanist, rationalist, universalist (and even dialogic) positionings were inadequate to move students on from their stuck places, owing to the incapacity of rationalist approaches to tolerate the unknown and the uncertain (because unknowable), the affective (because non-rational) and the contextualised/local (because non-universal).

Lather (1998, p. 492) similarly, offers a counter-narrative rejecting ‘the rhetorical position of the “the one who knows”’ in favour of ‘a praxis of not being so sure’. A ‘praxis of stuck places’ might tolerate ‘discrepancies, repetitions, hesitations, and uncertainties, always beginning again’ (p. 491). What it refuses is ‘the privileging of containment over excess, thought over affect, structure over speed, linear causality over complexity, and intention over aggregate capacities’ (p. 497).

### **Liminality and thresholds**

Such a counter-narrative, or ‘thinking otherwise’, raises interesting tensions between the notion of liminality as described earlier, and the possible functioning of threshold concepts as we have outlined them. The two entities would seem, conceptually, to entail different spatial characteristics. The praxis advocated by Ellsworth and Lather as a means of dealing with the not-so-sure would seem to be well situated within the oscillations characteristic of liminal space. However, passage through a series of threshold concepts within a designed curriculum, often subject to the time constraint and pressure of a three year degree, and the validated requirements of professional bodies or other stakeholders with vested and pragmatic interests, would seem to be characterised by the very qualities of containment, structure, linear causality, and intention that Lather opposed. A constructively aligned ‘trip’ through a scheduled sequence of threshold concepts might well be seen as *teleological*, a doctrine of final causes, in which developments en route are primarily due to the ultimate purpose or design that is served by them, in this case achievement of the final learning outcomes of the programme. In this way threshold concepts might be seen as driven by persuasion and consensus, far different from the ‘ontological stammering’ discussed by Lather (1998, p. 495).

The metaphor of the threshold, of course, conjures the architectural space of the doorway, a transitional point or intersection rather than a space. Thresholds may be seen in this way as leading the learner on through a transformational landscape in a kind of epistemological steeplechase, towards a pre-ordained end. Inevitably, particularly given the formal role that assessment is likely to play within this sequence, issues of hierarchy and relations of power will need to be addressed in any analysis of a trajectory of threshold concepts across a degree programme. Liminality, on the other hand, offers less predictability, and

appears to be a more 'liquid' space, simultaneously transforming and being transformed by the learner as he or she moves through it. There are intriguing further issues to be pursued here, such as, perhaps, the relative difference between the teleological nature of undergraduate learning compared with the more liminally engaged nature of post-graduate research. The connection between liminality, creativity and problem-solving would also merit further enquiry.

### **Towards a conceptual framework of threshold concepts**

Given such tensions, in our emergent framework we see the threshold as the entrance into the transformational state of liminality. Gaining clearer insights into why some students find it troublesome both to understand and to express particular threshold concepts, and into why certain students undergo a transformational or even creative experience in what we have termed the liminal space of learning, whilst others clearly get 'stuck', is, we believe, a quest well worth pursuing. Any attempt to formalise or theorise our understanding of these complex phenomena will, we believe, have to take account of the notion of *variation* within learning, its implications and effects, which the work of Entwistle and his collaborators has done so much to advance.

A basic proposition is that student-centred teaching has, as a prime focus, an element of responsiveness that is sensitive to variation in the manner in which students engage with the context and content of learning. There are two points to be considered here. First, to be thus responsive requires the presence and *externalisation* of something (variation in student learning engagement) in a form that can be responded to. Furthermore, the said variation must be *actionable*. The process of 'externalisation', in turn, is essentially a methodological issue that can be addressed in a variety of ways, for example, by interviewing students or using inventory response data. Second, 'student learning engagement' is a broad term, and the variation within it can be generally formalised in terms of empirical (or conceptual) 'models' of differing multivariate complexity. At a basic level, for example, one such model might address variation in qualitatively different forms of intention, motivation, and process terms within the higher order dimensionality of the popular deep/surface metaphor. The intention here is not to advocate or contest the validity of any such generic model(s), but rather to foreground the self-evident fact that generic models are only useful, and indeed 'actionable', up to a rapidly reached point at which they become



inadequate proxies for the dynamics of student learning within discipline-specific courses. It is here, at this interface of *reached uselessness*, that the existence of threshold concepts provides immediate and compelling signposting for avenues along which to solicit variation in student learning and understanding (and misunderstanding) in a far more critical sense. The responsiveness to variation is no longer in the general sense (how are you going about learning?), or even the discipline sense (how are you going about learning subject x?), but is now operating at a critical micro-perspective level *within* the epistemology of the discipline itself and its discourse.

### **Enchantment, mimicry and the problem of objectivism**

Examples of how variation may thus be explicitly explored at the threshold concept level are contained in the findings of Cousin (2003), Meyer and Shanahan (2003) and Reimann and Jackson (2003). There are challenging issues in these studies that we need to address. Meyer and Shanahan (2003), in empirical work on threshold concepts within Economics undertaken at the University of South Australia, used ‘opportunity cost’ as a useful example for finding out whether students had an inclination to ‘think like an economist’. An interesting finding emerged from the Australian study.

At least one insight provided by this approach should also be mentioned. There appear to be important implications for the manner in which students are initially introduced to threshold concepts. It is speculated here that one implication of the argument presented thus far is that ‘first impressions matter’. Efforts to make threshold concepts ‘easier’ by simplifying their initial expression and application may, in fact, set students onto a path of ‘ritualised’ knowledge that actually creates a barrier that results in some students being prevented from crossing the ‘threshold’ of a concept. While this aside remains untested, it also reveals the potential insight that a systematic framework based on forms of troublesome knowledge may open up...The promise of this approach may be a method by which to identify more accurately *why* a student cannot grasp and express a threshold concept. (Meyer and Shanahan 2003, p. 15)

What appears to be taking place in the situations reported in this study is that when teachers introduce, or ‘scaffold’, a naïve version of a

threshold concept (in that it is a deliberately simplified and limited delineation), it seems to act to a certain extent as a proxy for the threshold concept. But though the use of such a naïve interpretation – in this case of ‘opportunity cost’, a sophisticated concept – is intended to aid students’ understanding, the Australian study found that this was often not the case, and the interpretation was found to operate more frequently as a false proxy, leading students to settle for the naïve version, and entering into a form of ritualised learning or mimicry. The concept offered appeared to have an enchanting, beguiling or ensnaring effect, simultaneously promising understanding but curtailing it at the same time by seeming to close down further avenues of enquiry or complexity. Reimann and Jackson (2003) report one interesting possible explanation for such mimicry in their investigation of threshold concepts acquisition in a first year Economics module.

... the fact that students’ perceive first year introductory Economics modules as mainly providing revision might hinder learning. Such perceptions may lead to a fossilisation of students’ existing conceptions, including potential misconceptions, and prevent reconceptualisation, and this might apply to the way in which students with previous knowledge of Economics conceptualise ... threshold concepts. We therefore need to ask where these perceptions come from. One possible reason might be that introductory curricula follow a standard sequence of mainstream Economics concepts and that teaching–learning environments in Economics have a tendency to be relatively uniform. This adherence to a standard content and a standard way of teaching it could potentially contribute to an overall appearance of sameness. Whether this is definitely the case needs to be explored further. (Reimann and Jackson 2003, p. 24)

We are reminded here of Lather’s plea, cited earlier, for a praxis ‘where the effort is to ... provoke something else into happening – something other than the return of the same’ (1998, p. 492). Reimann and Jackson also cite Halldén’s work on conceptual change, which draws attention to the importance of *contextualisation* in this respect.

If we ask students direct questions pertaining to theoretical principles, we risk getting responses that mirror verbatim learning only. If, on the other hand, we ask real-world questions, we are in fact testing much more than the students’ knowledge of theoretical principles. We are also testing their ability to contextualize problems in the realm of the appropriate scientific field as well as their ability

to identify a problem as a case in which a scientific principle is to be applied. (Halldén 1999, p. 56)

Cousin (2003), in her study of Otherness as a threshold concept in Cultural Studies courses, reports the existence of mimicry – ‘bypassing’ or ‘faking it’ – in the domain of affect and identity.

Williamson (1992) has argued that school boys can ‘do sexism’ just as they can ‘do the Ancient Romans’. They can bypass an interrogation of their own masculinity by otherising the Others as the passive agents of their own oppression; they can also churn out dutiful assessment assignments that attract good marks. Although the deep learning of Otherness implies abilities of empathetic engagement and self-reflexivity, conventional academic testing risks the encouragement of performances of mimicry. ‘Faking it’ in the learning of Otherness can mean securing a good examination result without engaging with the concept’s personally transformative potential. (Cousin 2003, p. 9)

This is not to ignore, however, the very real possibility that in certain circumstances students might well adopt what appears to be a form of mimicry as a serious attempt to come to terms with conceptual difficulty, or to try on certain conceptual novelties for size as it were. We would not wish to belittle or dismiss such responses as they may well prove to be successful routes through to understanding for certain learners. There is a clear need here for further research endeavour to increase our understanding of such coping strategies. Nonetheless we would still hold to the notion that ‘enchanted’ understandings might beguile us into a sense of greater comprehension than we might actually possess.

This signals a further need for caution, however, in terms of the problem of *objectivism*. By implying that enchantment might lead to limited, mimetic understandings it might easily be implied that there is then one definitive and total conceptual understanding available, to which the tutor aims to bring the learner in due course. This would imply an objectivist position which would be in contradiction to our earlier characterising of threshold concepts as discursive in nature, and therefore by implication, subject to the endless play of signification which language implies (Derrida 1978). Far from wishing to imply any such objectivist assumptions we would rather point to the likelihood of variation in the forms that learners’ understandings might take and, again, the need for further systematic enquiry into these issues.

### **Pre-liminal variation**

So, as a way of helping students, we can distinguish, in theory at least, between variation in students' 'tacit' understanding (or lack thereof) of a threshold concept. We see this situation of what we choose to call *pre-liminal variation* as a potentially important and useful means of opening up our understanding of why some students will productively negotiate the liminal space and others find difficulty in doing so. The question is: does such variation explain how the threshold will be, or can be, or can only be, approached (or turned away from) as it 'comes into view'? And how does it 'come into view'? Does the view look or maybe even feel appealing, or perhaps discomforting? Again, both epistemological and/or ontological factors may come into play at this pre-liminal phase. Cousin, for example, makes a useful comparison between the deployment of cultural capital and what she terms 'emotional capital' as one potential means of gaining purchase on this issue.

This result is likely to be a consequence of a student's deployment of cultural capital (particularly in relation to writing essays and examinations) at the expense of her emotional capital. For Williamson, it is up to the teacher to help the student get the balance between the two right. Otherwise, the variation in understanding produced by different levels of student engagement does not come into view for either teacher or student, nor in conventional testing regimes. (Cousin 2003, p. 9)

To move forward in our understanding of the acquisition of threshold concepts, from both teachers' and students' perspectives, we need to devise methods of observation and enquiry that allow us to explore variation in students' experiences of threshold concepts in rather special ways. The small-scale but important 'collaborative initiative' undertaken as part of the Enhancing Teaching–Learning Environments in Undergraduate Courses project<sup>1</sup> with colleagues in the Department of Economics at Staffordshire University provides an interesting example of such an approach and also the inherent difficulties involved in such an undertaking (Reimann and Jackson 2003). Without even mentioning 'opportunity cost' to novice students of Economics (who have yet to formally encounter the concept) these authors investigated how we might create an authentic scenario, devoid of Economics terminology, that presents an opportunity to 'think like an economist'. This is a non-trivial question, and it is precisely a knowledge of students' responses to such scenarios, and the variation within those responses, that might help

us remove some of the problems of teaching threshold concepts. The purpose of this particular case study was to gain insight into the pre-liminal variation in the learning of two specific threshold concepts, ‘opportunity cost’ and ‘elasticity’, amongst first year students, and to consider how this might be related to factors in the teaching–learning environment, and how in the light of findings the tutor on the programme might redesign existing approaches. Within the case study these authors sought authentic scenarios which were ‘as close as possible to students’ own experiences’ and which would ‘potentially lead students to apply their understanding of threshold concepts’ (Reimann and Jackson 2003, p. 7). The focus was:

... to use situations related to students’ everyday life and to investigate whether students’ thinking in such situations has changed as a consequence of learning and being taught about threshold concepts. The assumption is that if students have ‘crossed the threshold’ and have started to think like economists, then their thinking about everyday economic problems in authentic situations should have changed as well. We therefore needed to find a way of tapping into students’ thinking about such everyday economic problems (p. 7).

Moving to a rather different disciplinary context, Meyer and Land (2003) have commented briefly on the threshold concept status of a *limit* in pure mathematics. In the words of Cornu (1991, p. 153) ‘It holds a central position which permeates the whole of mathematical analysis – as a foundation of the theory of approximation, of continuity, and of differential and integral calculus.’ Picking up from the second section, we can see how Mathematics combines natural and symbolic language in dealing with the abstract. But in *approaching* the formalised symbolic definition of a limit, it has also been recognised by several writers that the natural language form of the term can create ‘troublesomeness’. A ‘limit’ in terms of pre-liminal variation may be thought about in common sense terms as a boundary, barrier, the end of something, and so on, that is for example, visible, real, attainable or reachable in some everyday sense. But this interpretation is fundamentally what a limit in mathematics is *not* about – ‘limits’ are not reached, they are ‘tended towards’. Cornu (1991, p. 154), in referring to work by Schwartzburger and Tall (1978), observes ‘... that the words “tends to” and “limit” have a significance for the students *before* any lessons begin ... and that students *continue to rely* on these meanings after they have been given a formal definition.’ (Emphasis added)

## Conclusion

To encourage further such studies across different disciplinary settings we have, within this paper, outlined what we consider to be potential elements of an interpretive, explanatory and actionable conceptual framework. We would hope that the theoretical significance of this proposed conceptual framework lies in its explanatory potential to locate troublesome aspects of disciplinary knowledge within transitions across conceptual thresholds and hence to assist teachers in identifying appropriate ways of modifying or redesigning curricula to enable their students to negotiate such epistemological transitions, and ontological transformations, in a more satisfying fashion for all concerned.

Ultimately of course it is not for us (and we would not wish) to generalise across the varied and complex settings within which discipline-based colleagues might negotiate such transitions in the context of their own institutions and students. Nonetheless we hope that this emerging framework might offer a new lens through which to focus on critical micro-perspectives on variation, and in particular pre-liminal variation, in the quality of learning engagement. Course designers, we feel, might benefit from identifying sources of troublesomeness and stuck places for their students, the likely issues that might arise around identity, and how these can be sensitively and appropriately accommodated within the time and resource constraints of conventional university degree provision.

In reflexive fashion, as a number of our colleagues have already observed in conversations about threshold concepts, we hope that the idea of a threshold concept will serve to operate, in itself, as a threshold concept.

## Note

1. This paper was prepared as part of the work of the Enhancing Teaching–Learning Environments in Undergraduate Courses project, which is funded by the Teaching and Learning Research Programme of the Economic and Social Research Council (<http://www.trlp.org>). The project is being undertaken by a team drawn from the Universities of Coventry, Durham and Edinburgh. At the time of writing, members of the project team were Charles Anderson, Adrian Bromage, Kate Day, Noel Entwistle, Dai Hounsell, Jenny Hounsell, Ray Land, Velda McCune, Jan Meyer, Jennifer Nisbet and Nicola Reimann. Further information about the project is available from its website (<http://www.ed.ac.uk/etl>).

## References

- Biggs, J. (1999). *Teaching for Quality Learning at University*. Buckingham: SRHE and Open University Press.
- Brousseau, G. (1983). 'Les obstacles épistémologiques et les problèmes en mathématiques', *Recherches en didactique des mathématiques* 4(2), 165–198.
- Brousseau, G. (1997). *Theory of didactical situations in mathematics*. Dordrecht: Kluwer Academic Publishers.
- Cornu, B. (1991). 'Limits', In Tall, D. (ed.), *Advanced Mathematical Thinking*. Dordrecht: Kluwer Academic Publishers.
- Cousin, G. (2003). 'Threshold concepts, troublesome knowledge and learning about others', *Paper presented to the 10th Conference of the European Association for Research on Learning and Instruction (EARLI)*, Padova, Italy, August 26–30.
- Derrida, J. (1978). 'Structure, sign and play in the discourse of the human sciences', Cited in Lodge, D. (ed.) (1988), *Modern Criticism and Theory*. London: Longman.
- Ellsworth, E. (1989). 'Why doesn't this feel empowering? Working through the repressive myths of critical pedagogy', *Harvard Educational Review* 59(3), August 297–324.
- Ellsworth, E. (1997). *Teaching Positions: Difference Pedagogy and the Power of Address*. New York: Teachers College Press 297–324.
- Entwistle, N. (1981). *Styles of Learning and Teaching; An Integrated Outline of Educational Psychology for Students, Teachers and Lecturers*. John Wiley: Chichester.
- Goethe, R. (2003). *Ritual and Liminality (NCSS Theme: Culture) - Purpose, Background, and Context*. available at <http://www.uiowa.edu/~socialled/lessons/rituals.htm>
- Hallén, O. (1999). 'Contextual Change and Contextualisation', in Schnotz, W. Vosniadou, S. and Carretero, M. (eds.), *New Perspectives on Conceptual Change*. Amsterdam: Pergamon/Elsevier Science, pp. 53–65.
- Land, R., Cousin, G., Meyer, J.H.F. and Davies, P. (2005). 'Threshold concepts and troublesome knowledge (3): Implications for course design and evaluation', in Rust, C. (ed.), *Improving Student Learning*. Oxford: Oxford Centre for Staff and Learning Development.
- Lather, P. (1998). 'Critical Pedagogy and Its Complicities: A Praxis of Stuck Places', *Educational Theory* Fall 1998, 48(4), 487–498.
- Marton, F., Hounsell, D. and Entwistle, N. (eds.) (1997). *The Experience of Learning* (2nd edition. Edinburgh: Scottish Academic Press).
- Meyer, J.H.F. and Land, R. (2003). 'Threshold concepts and troublesome knowledge: Linkages to ways of thinking and practising within the disciplines', in Rust, C. (ed.), *Improving Student Learning: Improving Student Learning Theory and Practice – Ten Years On*. Oxford: Oxford Centre for Staff and Learning Development.
- Meyer, J.H.F. and Shanahan, M. (2003). 'The troublesome nature of a threshold concept in economics', *Paper presented to the 10th Conference of the European Association for Research on Learning and Instruction (EARLI)*, Padova, Italy, August 26–30.
- Perkins, D. (1999). 'The many faces of constructivism', *Educational Leadership* 57(3) 6–11.
- Ramsden, P. (ed.) (1988). *Improving Learning: New Perspectives*. London: Kogan Page.

- Reimann, N. and Jackson, I. (2003). 'Threshold concepts in economics: A case study', *Paper presented to the 10th Conference of the European Association for Research on Learning and Instruction (EARLI)*, Padova, Italy, August 26–30.
- Siegfried, J.J. and Sanderson, A.R. (1998). 'Using sports to teach economics', in Becker, W.E. and Watts, M. (eds.), *Teaching Economics to Undergraduates: Alternatives to Chalk and Talk*. Cheltenham: Edward Elgar.
- Schwartzenberger, R.L.E. and Tall, D.O. (1978). 'Conflicts in the learning of real numbers and limits', *Mathematics Teaching* 82, 44–49.
- Trubshaw, B. (2003). 'The metaphors and rituals of place and time - an introduction to liminality, or Why Christopher Robin wouldn't walk on the cracks', available at <http://www.indigogroup.co.uk/edge/liminal.htm>
- Turnbull, C. (1990). 'Liminality: A synthesis of subjective and objective experience', in Schechner, R. and Appel, W. (eds.), *By Means of Performance: Intercultural studies of theatre and ritual*. Cambridge: Cambridge University Press.
- Turner, V. (1969). *The Ritual Process: Structure and Anti-Structure*. London: Routledge and Kegan Paul.
- van Gennep, A. (1960). *The Rites of Passage*. London: Routledge and Kegan Paul.
- Williamson, J. (1992). 'How does girl number twenty understand ideology?', in Alvarado, M. and Boyd-Barrett, O. (eds.), *Media Education: An Introduction*. Milton Keynes: Open University Press.
- Winnicott, D.H. (1971). *Playing and Reality*. New York: Basic Books.



Copyright of Higher Education is the property of Kluwer Academic Publishing and its content may not be copied or emailed to multiple sites or posted to a listserv without the copyright holder's express written permission. However, users may print, download, or email articles for individual use.

Copyright of Higher Education is the property of Springer Science & Business Media B.V.. The copyright in an individual article may be maintained by the author in certain cases. Content may not be copied or emailed to multiple sites or posted to a listserv without the copyright holder's express written permission. However, users may print, download, or email articles for individual use.