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Shifting relations with the more-than-human: six threshold concepts for transformative sustainability learning

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Using the iterative process of action research, we identify six portals of understanding, called threshold concepts, which can be used as curricular guideposts to disrupt the socially constituted separation, and hierarchy, between humans and the more-than-human. The threshold concepts identified in this study provide focal points for a curriculum in transformative sustainability learning which (1) acknowledges non-human agency; and (2) recognizes that the capacity to work with multiple ways of knowing is required to effectively engage in the process of sustainability knowledge creation. These concepts are: there are different ways of knowing; we can communicate with non-human nature and non-human nature can communicate with us; knowing is relational; transrational intuition and embodied knowing are valuable and valid ways of knowing; worldview is the lens through which we view reality; and the power of dominant beliefs (represented in discourse) supports and/or undermines particular ways of knowing and being as in/valid.

Keywords: sustainability education; transformative learning; threshold concepts; more-than-human; epistemological stretching; threshold concepts

Introduction

In this paper we identify a set of threshold concepts (Meyer and Land 2006) that can be used as curricular guideposts to enable students to engage effectively with diverse and marginalized knowledges and thus support transformative sustainability learning. For us, transformative sustainability learning involves moving beyond epistemic and ontological assumptions embedded in modern western culture, particularly with respect to human relations to the more-than-human, or nature. We use the phrase more-than-human, non-human and nature interchangeably to designate the non-human entities with whom we, as humans, are always in relation. Such an approach includes a pedagogical move to recognize nature as co-instructor (Russell 2005), and supports a teaching orientation that takes as its starting point the ‘assumption that the natural world is literally able to speak’ (Blenkinsop and Piersol 2013).

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Background

Mounting evidence of the anthropogenic causes of climate change, and other socio-ecological disasters have generated increasing pressure on education to ‘fix’ unsustainable human activities. One of the root causes of some of these events, and the human behaviors that catalyze them, is the continuing, and socially constituted separation between humans and the more-than-human (Abram 1996, 2010; Plumwood 2002). This separation works to reinscribe the non-human as mute and dumb, and the human as superior (Abram 2010; Bai 2013). Such a dualistic arrangement keeps humans and those who are not human in a hierarchical relationship. It also makes it very difficult, if not impossible, to inhabit the world in all its sentience as it positions humans as separate from the more-than-human (Bai 2009; Ingold 2013; Plumwood 2002). This is not to say that all educational programs and courses reproduce this separation and silencing, but given the many ways in which both neoliberal and anthropocentric agendas dominate educational practice and policy, many do.

There is a need to move beyond the psychic numbing that has deafened human perception to the more-than-human (Bai 2009) and support students to become more ‘alive to the world’ in all its sentience (Abram and Jardine 2000; Ingold 2013). Although human connection to the more-than-human (Abram 1996) or ‘natural’ world has long been discussed in the fields of both environmental and sustainability education, the natural world has not often been acknowledged as literally being able to speak (for notable exceptions, see Bai 2013; Barrett and Wuetherick 2012; Blenkinsop and Piersol 2013; Russell 2005). Rather than further contributing to the socially constituted separation and hierarchical relations between humans and the more-than-human, we suggest that recognition of and engagement with the more-than-human as agential and communicative beings is at the core of a transformative sustainability learning. By transformative sustainability learning we mean the kind of learning that involves ‘a deep structural shift’ that changes understandings of the self in relation ‘with other humans and with the natural world’ (Morrell and Connor 2002, xvii). Such an education would value multiple epistemologies, including those that have been silenced by the privileging of materialist ontology and western understandings of rationality in its various forms (Santos 2007). Until the voices of the more-than-human are acknowledged, and students are supported to learn the skills of ‘hearing’ them, human attempts at addressing complex sustainability concerns will miss important information and perspectives. As Fawcett (2000) notes, ‘the choices we make and the actions we take on any environmental problem depend on the quality and reflexivity of our knowledge making’ (136–137).

Threshold concepts

The term ‘threshold concept’ emerged from a consortium of leading academics in the United Kingdom who were exploring issues of quality learning in higher education (Barradell 2013). Threshold concepts identify particularly troublesome, transformative, irreversible and integrative ideas central to a discipline or field of study – in this case, transformative sustainability learning which engages the more-than-human as active communicating agent rather than simple object to be studied. Meyer and Land (2006) propose that certain disciplines contain threshold concepts that once understood, often have ‘a transformative effect on internal views of subject matter, subject landscape, or even world view’ (i). Although threshold concepts can be concepts in the conventional sense of an important core understanding, they are

often much larger than that. They provide portals of understanding that lead to a new or ‘unknown space,’ or new ways of thinking about a field of study. An encounter with threshold concepts encourages critical reflection and contemplation. Such encounters often take students into a space of liminality and, if successfully grasped, prompt epistemic and ontological change (Quinlan et al. 2013). The processes of such learning, and student readiness for such learning, are complex and have been theorized by many, including Bateson (1972), Mezirow (1978, 2000), O’Sullivan (1999) and Stirling (2010). They include, as Stirling (2010) points out, nested levels of learning – from the metaphysical to actions – each informing and influencing the other. This kind of learning is not easy, not only because it includes many levels of learning, – but it often requires unlearning as well. In sum, threshold concepts, particularly the ones put forward in this paper, require examining deeply, and often unconsciously, engrained assumptions and beliefs.

The threshold concepts identified in this study provide focal points for a curriculum in transformative environmental and sustainability learning which both acknowledges non-human agency and recognizes the many ways of knowing which support co-creation of knowledge with the more-than-human. In other words, they highlight trouble spots, collaboratively identified by students and researchers, in conceptualizing and practicing engagement with the more-than-human as sentient, communicative and volitional. Once identified, these threshold concepts can provide important guidance in curricular design (see e.g. Barrett et al. [forthcoming](#)).

Threshold concepts are different from core concepts, which may be critical building blocks for understanding a field of study, but do not necessarily prompt a ‘qualitatively different view of the subject matter’ (Meyer and Land 2006, 6). Core concepts do not move students into a liminal state, nor demand ontological or epistemic shifts. Once understood and internalized, threshold concepts can provoke shifts in identity and lead to ‘new and previously inaccessible ways of thinking about something’ (Meyer and Land 2003, 1). The most important of the concept qualities are their troublesome and transformative nature – and in some cases it is these two characteristics alone that have been used to identify a threshold concept (Barradell 2013). To determine what are and are not threshold concepts, we are guided by the following criteria and definitions, adapted from Meyer and Land (2006). We used all seven characteristics, with an emphasis on the first three.

- (1) *Troublesome*: The concept is counter intuitive and initially difficult to understand. They may also clash with currently held values and conflict with one’s current world view.
- (2) *Transformative*: The concept alters one’s perception of the area of study or of life in general. This quality correlates to Mezirow’s (1978) ‘perspective transformation’ in transformative learning theory.
- (3) *Irreversible*: Once mastered, it is difficult to unlearn the concept and return to one’s previous ways of thinking.
- (4) *Integrative*: The new concept provides an integrative framework for inclusion in one’s ways of thinking and being. It is integrated into one’s existing ways of thinking.
- (5) *Discursive*: Changes the way the learner talks about the conceptual space.
- (6) *Reconstitutive*¹: Reconfiguration of the learner’s subjectivity/identity.
- (7) *Bounded*: outlines a particular conceptual space, such as ‘transformative environmental and sustainability learning.’

The bounded conceptual space we are describing here is a form of transformative sustainability learning in which the more-than-human is acknowledged as an active contributor to knowledge generation.

This approach to transformative sustainability learning resonates with Sandri's (2013) argument that systems thinking is an important threshold concept for education for sustainability. Sandri suggests that 'an appreciation of complex interconnections and systems is a key part of the practice of sustainability' (811). She then goes on to explain that different ontological, epistemological and axiological assumptions greatly influence understandings of what constitutes a system, which is a flexible term often understood to denote multiple forms of interconnections. A systems approach which accounts for the more-than-human as agent is essential for disrupting the anthropocentric privilege that dominates most post-secondary education. Such an approach also enables students to seriously consider Indigenous ways of knowing that are too often assumed to be myth and legend (Harmin 2014).

Study context

This study draws on three years of data from ENV5 811: Multiple Ways of Knowing in Environmental Decision-Making. This elective graduate-level course involves critical examination of human-nature relations and pays particular attention to intersections between animism, trans-rational knowing, and Indigenous epistemologies. Although its primary focus is on epistemological stretching, given the close association between epistemology and ontology (Bateson 1972), the focus on epistemology often extends to issues of ontology as well. A key context for the course is the preparation of students to work and/or conduct research with Indigenous peoples. The pedagogical approach, including learning outcomes, key in-class activities, and assignments have been described elsewhere (Barrett, Harmin, Maracle and Thomson 2015; Barrett and Wuetherick 2012; Flowers, Lipsett and Barrett 2014). The course supports the development of a reanimated perception (Bai 2009) and students' ability to respectfully engage ways of knowing and being that acknowledge the agency and communicative abilities of the non-human.

Methodology and methods

This research is part of a much larger, nationally funded research project focusing on understanding Indigenous knowledges from an ontological perspective, and development of pedagogies to assist in the bridging of Western and Indigenous knowledges in resource management contexts. We chose action research as our overall methodological approach because of its reflective and emancipatory orientation (Kemmis and Wilkinson 1998) as well as its focus on improving practice and generating theory simultaneously (Carr 1995). Action research is based on a constructivist notion of knowledge and iterative cycles of knowledge-generation, action, and reflection to generate new, more refined, and useful knowledge (Kemmis and Wilkinson 1998). Students and professor worked collectively, and iteratively, to identify, test, and describe the threshold concepts laid out below. As we reflected on stories, course assignments, and the chart data, we drew on a combination of intuitive, rational, transrational and embodied knowing when determining the threshold concepts, and how to best represent them.

Methods for identifying threshold concepts are varied. In a recent synthesis of methods, Barradell (2012) advocates a ‘transactional curriculum inquiry’ approach originally outlined by Cousin (2009, 2010). This approach includes a back-and-forth between learners, subject specialists and educational researchers (Cousin 2009) and includes a clear set of definitions, understood by all involved, regarding what constitutes a threshold concept. Barradell (2012) also suggests including professionals in the field in these deliberations.

Our process includes critical analysis of student narratives of experience, focus groups, and a chart survey, all described below. It also includes a master’s thesis, analysis of course assignments, and instructor reflexivity. Co-authors of the paper include the course instructor and five students from the fall term 2011 and 2012 offerings of the course. Our research was further enriched and supported through consultation with Indigenous Elders and the paper’s Mohawk co-author, Karonhiakta’tie Bryan Maracle. Along the way we have been continuously aware that we are not the only ones involved in this research project, and have, on occasion, sought advice from ancestors and the more-than-human through ceremony and use of intuition.

The first data-set for analysis consisted of narratives of experience. Based on disciplinary diversity, interest, and availability, three students were invited to co-present at the International Symposium on Society and Resource Management (ISSRM) after the course was completed in the spring of 2012. To prepare for the conference, students wrote narratives of experience, identifying epiphanic moments in their learning as a result of the course and then collectively identifying recommendations for action. After writing and presenting these reflective stories (Patterson, Flowers, Bors and Barrett 2012) and action recommendations, the students independently identified what they felt were threshold concepts for them based on the three characteristics of: transformative, troublesome, and irreversible, as defined above. These three students then came together in a focus group meeting with the course instructor to share their individual compilations and generated a synthesized list, combining concepts that were repetitive and keeping most of those that, although they only appeared once, seemed particularly important to the students and met the main criteria for a threshold concept set out by Meyer and Land (2006).

The next year, halfway through the class, the new group of students were asked to brainstorm, first independently, then collectively, a list of threshold concepts as a reflective exercise on what they were learning. The concepts presented by these two groups were combined, then cross-checked with key themes emerging from student assignments, and two additional post-course focus group discussions that explored pivotal experiences in the course. Student co-authors and course instructor then generated a synthesized list of concepts and a survey chart that was distributed to all students in the three years of the course (Winter 2011, Fall 2011, Fall 2012). The chart response rate was 13/23 students, or 56.5%. Most responses were from the last two classes; only one out of the five students in the winter term 2011 class responded, which reduced the overall response rate. Responses from all students were thorough and thoughtful.

These charts included the following columns, representing the draft list of concepts: (1) there are different ways of knowing; (2) We can communicate with nature and nature can communicate with us; (3) knowing is relational; (4) transrational intuition and embodied knowing is a valuable and valid way of knowing; (5) worldview is the lens through which we experience reality; (6) academia sometimes does support transrational intuition and embodied knowing; and (7) integration of

traditional ecological knowledge (TEK) into decision-making framed within a ‘Western’ paradigm is often disrespectful. A final column for a new concept not yet identified was also included.

For each of the concepts, students were asked to reply to a set of questions about the concept: (1) What does this [concept] mean to you? (2) How did you learn this? They were then asked to comment on each of the concepts, answering the following questions (a) How was this concept troublesome to you? (b) Is this concept irreversible for you? Explain. (c) If it isn’t irreversible, why has your thinking reversed? (d) Did you integrate it into your existing ways of thinking? (e) How? (f) In what ways was this concept transformative for you? and (g) If it was not transformative, please leave the box blank or add an explanation. We also included space to invite the addition of any threshold concepts that were not already included. Following the tradition of previous threshold concept studies, we focused on the qualities of troublesome, transformative, integrative and irreversible (Barradell 2013) in the survey chart, but when determining the final concepts, filtered the data through all seven threshold concept characteristics listed above. The data presented below comes from these charts as it provides an effective synthesis of perceptions represented across all stages of data collection.

Threshold concepts identified

Based on a review of the data and the criteria for threshold concepts, we revised this original list to a total of six threshold concepts and present them here for further testing and debate. They are:

- (1) there are different ways of knowing;
- (2) we can communicate with non-human nature and non-human nature can communicate with us;
- (3) knowing is relational;
- (4) transrational intuition and embodied knowing is a valuable and valid way of knowing;
- (5) worldview is the lens through which we experience reality;
- (6) power of dominant beliefs (represented in discourse) supports and/or undermines particular ways of knowing and being as in/valid.

Based on the collective data and characteristics of threshold concepts, we determined that the concept ‘academia sometimes does support transrational intuition and embodied knowing’ was not a threshold concept, but a realization that made visible the power of discourse in students’ educational lives. Similarly, the understanding that ‘integration of traditional ecological knowledge (TEK) into decision-making framed within a “Western” paradigm is often disrespectful’ appeared as an important learning outcome, but the data did not clearly demonstrate that it was a threshold concept. A close review of student responses led to the recognition that we needed to include an additional concept: power of dominant beliefs (represented in discourse) supports and/or undermines particular ways of knowing and being as in/valid. The concept had been brought forward by one of the student presenters at the ISSRM conference, but since no consensus about its inclusion was achieved at that time, it was not deemed a concept until it re-emerged in the chart data. Only one student added an additional concept: ‘People fear what they are ignorant of.’ This was not deemed to be a threshold concept, but may be an important idea to consider.

Using data from the threshold concept charts, the next section illustrates students' encounters with the concepts and a representative sampling of ways in which they meet threshold concept criteria listed above. While some students entered the course having already 'crossed' some of the portals of understanding represented by some of the concepts, we, through our iterative analysis of multiple data sources, combined with intuitive insights and feedback from students, identified the following as particularly troublesome and transformative concepts which enable students to engage with the more-than-human as active communicating agential beings.

1. There are different ways of knowing

This concept tackles directly what Santos (2007, 16) refers to as an ongoing process of 'epistemicide' – the deliberate silencing of voices and epistemologies that are inclusive and holistic (see also Meyer 2008). For most of the students in the class, the concept that there are different ways of knowing in itself was not new, yet the range of epistemologies supported in the class was. For all students, its troublesome nature came from the tensions it created between their own identities as graduate students, and engagement with a more diverse set of epistemologies (see also Barrett and Wuetherick 2013; Barrett et al. *forthcoming*). This concept was frequently demonstrated in integrative and discursive ways. Many students use the course title 'multiple ways of knowing' or 'these ways of knowing' to refer to intuitive, transrational and/or embodied ways of knowing while another, who was familiar and comfortable with a diverse range of epistemologies, states that the course 'helped to give me a language to talk about multiple ways of knowing in a way that I was unable to before' (2012–7). One student notes that 'I've felt that parts of these things have been real for a long time (through my experiences of dreaming, animal-human interaction, coloring/painting etc.)' and then goes on to talk about the struggle to see these as valid in academia: 'I sometimes worry about being credible in academia while using embodied knowledge in research. I guess the troubling part is how I think others will view it.' (2012–3). Another student, whose undergraduate degree was in the sciences, noted that after exposure to such diverse ways of knowing she 'simply can't go back to an ignorant, rational scientific worldview' (2012–6). Another noted both openness and discomfort:

I recognize that my way of understanding the world is different from how other people might interpret it. As a result I am not upset or astonished when people voice these very different understandings. I try to learn from other ways of knowing as much as possible, but I admit that I don't feel comfortable adopting or incorporating some of these into my own understandings of the world. (2011–7)

For almost all of the students, this concept was identified as irreversible.

2. We can communicate with non-human nature and non-human nature can communicate with us

The notion that humans can communicate with 'nature' or 'other-than-human' others (and vice versa) is a widespread idea (Taylor 2005), but has become difficult to comprehend in an anthropocentric culture where humans are seen as separate from and superior to all other beings (Plumwood 2002). This concept was the most challenging for the greatest number of students as it required a reconceptualising their relationships with the more-than-human world. The student chart data highlights this

threshold concept as particularly troublesome, irreversible and integrative, although for a few, it was affirmation of what they already knew but hesitated to share publicly (see threshold concept 5). For instance, one student states:

I find the idea of communicating with non-human persons challenging. Even though I have direct personal experience doing this, my upbringing and the dominant world view of my reality make it difficult for me to whole heartedly engage in doing so. (2011–3)

Another comments: ‘My belief was communication between human and other-than-human beings was only one way. We are the resource managers after all’ (2011–5) and another states:

I haven’t talked about this much until recently, so it [communication with nature] must be troublesome ... though, not really as an inner dialogue, but more in the way that I don’t know how to talk about it with people. (2012–3)

The following comment demonstrates a crossing of this threshold: ‘Well it’s not that awkward to me anymore when I feel like there’s a connection with my environment suddenly or when I have the urge to communicate with a plant in any way’ (2012–6). The next represents a sentiment expressed by at least two students each year who already knew this, but had few, if any, academic spaces within which to experience or theorize it: ‘I don’t know why but this was inherently logical for me. I always somehow felt that way’ (2012–6). All but one student stated that this concept was irreversible. For instance, ‘Firsthand experience makes it difficult for me to forget and ignore this idea’ (2011–3), and ‘Irreversibility here is a function of perceiving the communication. If communication is ongoing, a part of your life experience, then on this point your view is fairly irreversible’ (2012–4). This final comment comes from the one student who had a different perspective, and stated: ‘It is not irreversible. It is easy to fall back into old patterns, and not pay attention to our surroundings if we get caught up in mental chatter’ (2012–2).

3. Knowing is relational

This concept recognizes that all knowledge is situated, constituted not only in relation to each person’s individual history and episte-ontological assumptions but also co-constructed through relationships with other humans, ideas, institutions, and those other-than-human beings with whom they share their lives. It resonates with and extends Deloria’s (1999) description of a relational worldview wherein one is in relation with ‘all life forms that exist within the natural world’ (cited in Kovach 2009, 34). This concept was particularly integrative, and for many students, irreversible. It also provided linkages to the first and last threshold concepts identified. For example, one student notes that ‘once [she] accepted other ways of knowing, relational knowing seemed logical’ (2011–6), and another states that ‘There is also a relationship between your worldview and the knowledge which makes sense, and being aware of this relationality is an important reflexive practice’ (2012–4).’ This concept was irreversible for those students who grasped it: ‘I can’t go back to thinking that I am an isolated person/event. Things are connected.’ (2012–3); ‘Once I accepted other ways of knowing, relational knowing seemed logical’ (2011–6). For another student, this threshold

concept completely transformed my paradigm concerning nature and my relationship with it. Far more dynamic relationship, and participation is such an important part of this newly developed relationship ... For me, knowledge wasn't about relations, it was simply a data table, statistics, and outcomes. (2011–5)

Many of the students' chart responses suggest this concept was central to transforming their understanding about knowledge, knowing, and its construction.

4. Transrational intuition and embodied knowing are valuable and valid ways of knowing

The most troubling thing about this threshold concept for the students was the validity that transrational and embodied knowing was given in the course, and the fact that it was a topic of study in the first place. Transrational knowing is knowing that goes beyond rationality rather than being counter to it (Astin 2002). Sometimes referred to as transpersonal knowing, or simply 'intuition,' it includes unexplainable intuitions, a sense of 'just knowing,' gut feelings, dream knowledge, remote viewing, presentiment or pre-cognition (Bernstein 2005; Hart, Nelson, and Puhakka 2000). Although transrational knowing is often recognized as being spiritual in nature, in the course, the focus was on the strengths and limitations of transrationality as a way of knowing, rather than debating whether the sources were spiritual or not. Like the first threshold concept, there are different ways of knowing, one of the most troublesome aspects was the appearance of transrational knowing in students' graduate program. For instance: 'I've felt parts of these things have been real for a long time ... I'm still unlearning that they aren't valid ways of knowing, especially in academia. (2012–3);' 'I've always had intuition. I just never gave it much stock before' (2012–2), and 'often in scientific and western culture such ways of knowing are seen as paranormal and/or fictional; diminishing their validity and use in research and management' (2011–2). This concept was universally identified as irreversible except by one student. It also had integrative qualities, as well as implications for both personal and professional identity and the ways in which students could conduct their work: 'It helped me to listen to a part of myself I had been ignoring' (2011–7), 'it makes me feel whole again' (2012–6). Also: 'this really fleshes out the picture of the multitude of ways of knowing. Acknowledging the validity of non-dominant ways of knowing means that these capacities can then be brought to bear in your life and work' (2012–4). This concept was also identified as having implications for respecting other peoples and their knowledges: 'People I discredited before I take much more seriously now' (2011–5). It also had discursive qualities in that it offered 'academic' language to talk about a way of knowing that was familiar to many but not discussed previously in their academic studies.

5. Worldview is the lens through which we experience reality

Sterling (2010) states that a goal of epistemic learning is that one sees one's worldview rather than to see *with* one's worldview. Furthermore, as Dei (2002, 70) notes, 'there is a recognition that educators and learners must start to offer multiple and collective readings of the world' which includes not only multiple knowledge forms, but also multiple ontologies. Yet the recognition of one's worldview – and that one has a worldview which frames ones thinking, experiences, and epistemologies – can be uncomfortable to learn. Although some students had already learned this through

previous life experiences, travel, and so forth, both they and those who were learning it for the first time identified it as troublesome and transformative. In either case, this threshold concept led to understandings such as: ‘Reality is dependent on the person experiencing it, thus different realities exist for different people’ (2011–3). ‘With this concept we go from experiencing reality, to experiencing the reality visible with our current lenses.’ (2012–4). This concept was not particularly discursive, but did provide strong linkages to students’ understandings of their identities and epistemologies: ‘Worldview shapes who you are and how you see things. People’s beliefs and values are shaped by their worldview’ (2012–3) and ‘It can be troubling to understand that [that] which allows you to make sense of the world is also that which circumscribes which parts of the world you can know, and how you articulate that knowing’ (2012–4). The notion that worldview clearly affects one’s epistemology and vice versa was also represented: ‘I’ve always had a western epistemological way of knowing my reality. I learned about other realities in [the course].’ (2013–2). Although the concept itself was clearly identified as irreversible, the possibility of shifting one’s own worldview was not.

6. Power of dominant beliefs (represented in discourse) supports and/or undermines particular ways of knowing and being as (in)valid

Discourse refers to habitual forms of thought and the ways in which they are reproduced. It is representative of belief systems, ideologies and consensual knowledge exposed through oral and written text (Kelsey 2003) as well as everyday actions. Discourses are an effect of power (Foucault [1976] 1988) and can support and/or challenge the dismissal, ridicule, absence, usefulness or appreciation of particular ways of knowing and being. Students referenced this concept most often in statements about feeling uncomfortable acknowledging or speaking about diverse epistemologies. For example:

As much as I would like to incorporate this into my academic career I do not feel it is fully accepted by enough people to be considered legit. I am hesitant to broadcast using these forms in my academic work. (2012–2)

As students began to identify ways in which their thoughts and beliefs were discursively produced, they became more open to new(old) ideas. As one student notes: ‘It started in [the] class that taught me how to identify discourses. This removed many of the roadblocks and allowed me to accept other ways of knowing and prevented myself getting in the way’ (2011–5). Another comments: ‘Individuals understand and approach the world differently based on varying cultural and cosmological discourses and life experiences. ... Some components of transrational knowing are disturbing due to their mysterious nature and unknown origin’ (2011–2). Grappling with the nature of discourse and its power to produce reality enabled students to step back and examine where and how their epistemological and other beliefs had been produced.

Summary and conclusion

We present these threshold concepts for ongoing consideration. Based on research and lived experiences in the graduate School of Environment and Sustainability (Barrett and Wuetherick 2012; Flowers, Lipsett, and Barrett 2014), they provide an important set of curricular guideposts for a form of environmental and sustainability

learning that supports undoing settler colonization with respect to epistemology, ontology, and in particular, relations between humans and those who are not. Unsustainability is built into the foundations of modern civilization. An ideal starting place for reorientation is to start with a focus on expanding the ways of knowing that students respect, understand and/or engage with. Foregrounding ‘epistemological stretching’ (Barrett et al. 2015) as a pedagogical approach has been shown to support students in reconceptualising relationships to previous epistemological and ontological assumptions, and their relationships to non-human beings (Barrett et al. [forthcoming](#); Harmin 2014). While some of these ways of knowing can be immensely valuable, like any epistemology, they also need to be used with skill and maturity.

At a time when effective engagement with diverse knowledges is becoming a core educational competency, particularly where innovative solutions to increasingly ‘wicked’ environmental and sustainability problems are needed (e.g. Miller et al. 2008), the threshold concepts outlined are worthy of pedagogical attention. Whether explicitly stated or part of the ‘hidden curriculum,’ when incorporated into pedagogical practice, they have great potential to transform dominant assumptions about who gets to be co-instructor and co-constituter of knowledge. They are troublesome, transformative, integrative, and in most cases, discursive. They are also (re)constitutive of students’ identities. They either affirm what students know internally, but are hesitant to explicitly acknowledge in their academic contexts, or, more significantly, nudge them across a threshold to grasp some of the many ways in which their own understandings and identities are, and have been, constituted.

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Note

1. Although both these qualities were pervasive, a thorough discussion of the reconstitutive and liminal nature of these concepts is beyond the scope of this paper and will be the topic of a future manuscript.

Notes on contributor

M.J. Barrett is an assistant professor in the School of Environment and Sustainability, University of Saskatchewan. Research interests include epistemology, human-animal and human-nature communication, and environmental education.

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