ESSAY

Thinking Past the Portal: Threshold Concept Metaphors for Diverse Learners in Disparate Disciplines

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Abstract

In the early 2000s, Jan Meyer and Ray Land argued that disciplinary knowledge could be thought of as "threshold concepts" (TCs): specific, definable ideas that learners need to master to become experts. As implied by the word "threshold," Meyer and Land suggested that educators think of TCs as portals through which students pass as they learn disciplinary knowledge. Our teaching experience in multiple disciplines has led us to question what the threshold metaphor reveals and occludes for educators and students. We begin this article with a general discussion of metaphors and their social construction, including how metaphors influence thought. We then present additional metaphors that may be used to supplement (or even replace) the portal/doorway metaphor and suggest ways metaphor can be used to teach specific disciplinary threshold concepts. Our goal is not to challenge the idea of threshold concepts but to argue that metaphor should be explored beyond the portal/door suggested by Meyer and Land. We also argue that the process of working across disciplines to discuss and propose threshold-concept metaphors can be a productive way for faculty to develop a deeper understanding of this important pedagogical framework.

Keywords:

threshold concepts, university pedagogy, writing studies, information science, mathematics

In the early 2000s, Jan Meyer and Ray Land (2005, 2006) argued that disciplinary knowledge could be thought of as specific, definable ideas that learners need to master in order to become experts. Mastering these "threshold concepts" (TCs) would lead to "a transformed way of understanding, or interpreting, or viewing something without which the learner cannot progress" (Meyer & Land, 2006, p. 3). As implied by the word "threshold," Meyer and Land suggested that educators think of TCs as "portal[s]" through which students would pass as they learn disciplinary knowledge (Meyer & Land, 2006, p. xv). Many subsequent authors have substituted the more common metaphor of "door" or "doorway" for Meyer and Land's "portal" to discuss TCs (e.g., Davies, 2016, p. 124; Holmwood & Scales, 2019, p. 65; Monteil et al., 2019, p. 859; Mosurinjohn, 2021, p. 80), but both metaphors rely on the relatively quick transition between one space and another through some connective opening.

Threshold concepts have proven to be of great utility to the scholarship of teaching and learning (SoTL). Although specific disciplines have their own TCs, the larger TC framework is cross-disciplinary. Just over the past decade, *Teaching & Learning Inquiry*, an international SoTL journal, has published articles focusing on TCs in literary studies (Corrigan, 2019), women and gender

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studies (Hassel & Launius, 2017), and problem-solving skills (Wismath et al., 2015). Other SoTL-focused journals have featured scholarship exploring how TCs can support critical thinking and reflection (McLean, 2009), educational leadership (Webb & Tierney, 2020), undergraduate business communication (Getchell & Lentz, 2020), computer programming education (Kallia, 2020), and more. One reason the TC framework has been so generative for SoTL researchers is that it is learner-focused: Meyer and Land (2005) argued from the start that TCs could help faculty members design curricula that were more focused and accessible for students. TCs become a course's center of gravity, so to speak, around which smaller facts and concepts revolve.

For example, in their articulation of a framework for educational developers to use to help faculty across the disciplines engage with TCs, Timmermans and Meyer (2019) note that "*effective teaching focuses on promoting student learning* [italics in the original]," and they urge educational developers to take "a learning-centred, rather than teaching-centred approach" (p. 355). This focus on learners is present in the vast majority of the TC scholarship we consulted. However, existing scholarship also acknowledges that, as Timmermans and Meyer point out, teaching from a TC approach is difficult: "There is initial excitement as a teacher first hears of TCs, identifies possible TCs, and shares this 'discovery' with colleagues. But then, a sense of frustration or bewilderment might set in. What must now be done with these TCs? What effect does this 'discovery' have?" (p. 354). We hope that this article will be helpful to faculty members who wrestle with these questions.

TCs are difficult for students as well. Many TCs challenge students' prior knowledge and tacit understandings (Meyer & Land, 2006, pp. 9–13). TCs may represent different ways of looking at the world than students are familiar with, and they may be articulated in language that, because of its discipline-specific lexis, is difficult for students to understand (p. 14). These challenges mean that most students take some time to learn TCs, passing through a "liminal period" in which they are aware of a given concept but have not yet mastered or internalized it (p. 22). To return to the doorway metaphor, this liminal period might be conceived of as a student peering through a doorway,

or perhaps setting a foot on the threshold, but not yet passing through.

As educators, each of us has found the TC framework to be powerful. The five of us have degrees in disciplines ranging from the sciences to writing studies, education to information literacy. We have taught a wide variety of undergraduate and graduate courses, and the TC framework has pushed us to consider the key concepts of our courses, helping us think at a more macro level than just skills or practices. It has also helped us better understand why some students may struggle with course material, and why sometimes it can seem like students are moving backwards for a time as they work to integrate new ways of thinking and doing. And for us, as faculty members, the doorway metaphor serves as a recognizable way of thinking about learning.

Is It Time for New Metaphors?

Despite our own comfort with it, we find ourselves questioning what the portal/doorway metaphor suggests about the nature of threshold concepts. Modern students are probably more familiar with portals in fantasy/sci-fi movies and video games, where they often serve as something akin to wormholes that instantly transport participants from one location to another. The fantasy/sci-fi usage of "portal" does not connote any significant liminality; similarly, when we walk through a doorway, we pass quickly and fully into another space—but does this accurately represent what happens when we learn? Learning is enormous, complex, deep, and expansively riddled with twists, turns, steps back and forward, and so on, entailing myriad complex cognitive changes that could occur instantaneously, over a semester, or over years.

To be sure, Meyer and Land, as well as the many scholars who have expanded upon their framework, readily acknowledge that learning is complex and individual, and that mastery of threshold concepts is usually not quick or linear. For example, Meyer and Land spend a significant amount of time discussing Turner's concept of liminality in terms of identity construction and life-stage transitions, noting that "Turner adopted the term 'liminality' (from Latin *limen*, 'boundary or threshold')," and acknowledging that liminal states are seldom comfortable and tend to extend over time (Meyer

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& Land, 2005, pp. 375–380). In fact, they briefly discuss how the doorway metaphor may not evoke the depth of liminality that can be experienced by learners:

> 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….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. (pp. 379–380)

As educators, we are intrigued by the second part of Meyer and Land's point—that liminality is liquid and unpredictable—and we agree that the metaphor of a portal or doorway does not fully represent the rich process of learning that the TC framework ultimately encourages. Timmermans (2010) poses that the liminal space is a pedagogical tool, positioning a learner not necessarily toward grasping this-or-that kernel of knowledge, but pointing them toward an uncertain opening where one learns how to learn. That is, "the purpose of education is much less about fostering growth in what learners know than facilitating development of the ways in which they know" (p. 14). Further, Land et al. (2018) argue that diverse ways of learning demand an educator's attention to the ways that thresholds are experienced. They write, "liminal states can vary with the learner…and so the teacher must somehow be aware of the nature of the individual learner's liminal state" (p. 208). A diversity of metaphors for introducing learners' new experiences thus enriches an educator's practical toolkit.

Metaphors are ideologically mediated and rely on our familiarity with the part of a metaphor to which a new concept is linked. For example, we invite readers to picture a situation where someone asked a colleague how a meeting went, and they replied, "Yikes! That meeting was a dumpster fire!" The understanding of that metaphor—the appreciation of how bad the meeting was—would rely on a familiarity with dumpsters and an ability to imagine a trash fire within one. It is relatively easy to see how culturally situated that particular metaphor is, and how it might be difficult to understand for some.

In the case of TCs, the "threshold" as part of a doorway has meaning for all of us, yet we are all of similar ages and hail from North America. In contrast, we have found that the word "threshold," applied to a portal or doorway, is largely unfamiliar to traditional-aged university students. As an informal experiment, we have asked multiple sections of writing students in the United States and Canada whether they were familiar with the word "threshold" as a part of a doorway. Almost none were. Instead, they associated "threshold" less with a physical doorway and more with how the word has been used as a metaphor in other contexts, such as a "threshold for admission" to university. While this is, of course, an accurate sense of the word "threshold," it does not connote the same things as Meyer and Land intended.

We also situate this article in the broader context of teaching and learning in higher education. Considering the diversity of our students' backgrounds, we believe it is wise to choose metaphors that speak to their experiences. Students bring diverse, intersectional ways of being and thinking to our courses. They want to find personal connections with their learning experiences. Similarly, their geographical, cultural, political, and historical knowledge systems shape their learning. All of this has challenged us to reflect on our teaching practice and reconsider how threshold concepts might be reimagined in our current contexts. Post-secondary enrollment in Canada has increased over the past 35 years, including an increase in Indigenous, Black, Francophone, LGBTQ+, and international students, along with students with disabilities, mature adult learners, and first-generation students (Strange & Hardy, 2016).

As Melinda Scott (2017) argues, "it is the increasingly interconnected nature of students' multiple identities that challenges us to reconsider the ways in which we are (or are not) appropriately supporting their success" (p. 201). Threshold concepts were introduced to university pedagogy nearly twenty years ago. In the intervening time, student demographics and universities themselves have changed; we have endured a global pandemic,

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fiscal booms and busts, the growth of online and hybrid learning, and more. Given all this, we think the way we teach threshold concepts deserves another look.

The rest of this paper has several key sections. We begin with a general discussion of metaphors and their social construction, including how metaphors influence thought and social action. We then present three metaphors that could be used to help students understand the overall characteristics of threshold concepts. Our goal is not to challenge the idea of threshold concepts, but to suggest metaphors that connote the rich, messy process of transformative learning. Next, we explore how metaphor can be used to teach discipline-specific threshold concepts that, in our experience, students have found difficult to understand. Finally, we provide suggestions for how faculty members at other institutions might explore new metaphors in the teaching of threshold concepts.

Reimagining the metaphors used to teach threshold concepts can have important implications for scholars, teachers, and learners alike. In this article, the metaphors we suggest and the ways we discuss them are often situated in our own disciplines. That said, a metaphor that is useful in one context may be taken up, modified, and repurposed in another even if the disciplines are seemingly unconnected. Just as the portal/doorway metaphor was taken up across contexts—starting in economics and traveling broadly—the metaphors we present in this paper can also be adapted for disciplines and contexts beyond our own.

How Metaphors Reveal and Conceal

Metaphors have three main components: a *source*, or a concept or object that is relatively familiar to the audience; a *target*, which is the concept or object that is compared to the source; and a *mapping* between the two. Thibodeau et al. (2017) give the example of "crime as a virus," in which the source is "virus" and the target is "crime" (pp. 852–853). They point out that mapping crime as a virus suggests certain actions that are connected to our understanding of viruses: that crime is a sickness that we need to discern the root cause of, and that if we treat both the causes and symptoms of crime, we can

eradicate it. The virus metaphor, then, can inspire real-world policies designed to address crime that would be quite different than if we employed a different metaphor. In *Metaphors We Live By*, Lakoff and Johnson (1980) argue that metaphors are not simply rhetorical flourish: they structure our thoughts and guide our decisions. We use metaphors to conceive matters in graspable terms, and then "we act according to the way we conceive them" (p. 5).

Hanne and Kaal (2019) describe metaphor as "a framing device, which both illuminates and conceals" (p. 6). The metaphors we use direct our attention toward certain aspects of whatever we are trying to describe. This understanding of metaphor is similar to Burke's (1966/2019) concept of terministic screens, which are essentially filters made of language (terms) through which we comprehend the world (p. 50). How we talk about things—and the language we use to describe the world—suggests some understandings and occludes others, and because we navigate the world through language, we cannot really access the world "outside" of it. Lakoff (2012) argues that as soon as we move from describing "concrete physical experience" (p. 205), we tend to rely on metaphor, and suggests that "the metaphor is not just a matter of language, but of thought and reason" (p. 208). We use metaphor to understand the world, but also to understand ourselves, how we learn, and how we participate in disciplinary communities (Goh, 2018; Ison et al., 2013; Montouri, 2011). Recall Freire's (2005) famous metaphor of banking as applied to education: instructors hold the knowledge and make deposits in students' brains, regularly checking to make sure the balance is increasing (p. 72). Understanding education through this metaphor has clear impacts on classroom practice, instructor and student behavior, course structure, and more.

Thibodeau et al. (2017) write that "metaphors have less of an impact when people lack relevant knowledge or interest in the source domain" (p. 856). This connects with our earlier suggestion that students are unfamiliar with the use of "threshold" as connected to a portal or doorway—if students have limited knowledge of the metaphor's source domain (the portal, doorway, or threshold), the metaphor will have less impact. However, it is not only students' unfamiliarity with the

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doorway metaphor that prompts our re-examination of it. To move beyond their preconceptions, students must consciously let go of previous perspectives that frame their understanding of a topic (Land et al., 2014). To accomplish this, students need to become aware that they are grappling with new material, and they need to accept that they are letting go of these preconceptions and moving into the unknown. However, even in the most uncertain of situations, we can anticipate what may exist on the other side of a door. One thinks of what is on the other side of a door differently depending on the type of door: the front door of a house may make people think of an entrance or a living room, a revolving door at a hotel may conjure images of a fancy lobby with too many area rugs and outdated furniture, or an industrial freezer door may conjure images of piles of ice cream containers and frozen pizzas on the other side. When we move through a doorway, we are rarely proceeding into the unknown.

Additionally, the doorway metaphor is static—we move through doorways, but the doorways themselves are stuck in time and space. More dynamic metaphors may help students embrace the liminality, relate to the pedagogical situation, accept the epistemological and ontological uncertainty, and commit to shifting their preconceived ideas about a concept. Land et al. (2014) explain that a learner's willingness to use a new way of seeing and acting in a field depends "on their understanding of the signified and their feelings about the learning process" (p. 204). Using dynamic metaphors can bolster learners' understandings of the signified and prompt positive feelings about the learning process.

To create dynamic metaphors, it is important to account for the socially situated nature of students' learning. Their learning is underpinned by their experience in the world, and these experiences become relational tools from which they can make connections. The metaphors we use, therefore, must aim to activate these experiences. Something as simple as a doorway is rather static. Just as experiences in the world are dynamic, so too are the metaphors we should use to describe threshold moments for students.

Social literacy theorists offer insights that coincide with this logic. This branch of theory relies on the recognition that pedagogies are most effective when they account for what students bring into the classroom (see Lea, 2004; Pahl, 2014; Street et al., 2015). A student's wider social experiences inform how they learn and how they form new mindsets (Street, 1998), and it is important to recognize that students move through the social world, acquiring various experiences, with increasing fluidity in the digital age (Hamilton, 2015). How a metaphor may resonate with a given student, then, depends on the institutional contexts, power relations, and social identities that shape their worldview (Street, 2009). Effective pedagogies, therefore, are relational, where what is learned involves negotiating student experience with new concepts, contexts, and epistemologies. A single metaphor—a doorway—may not work for all students in all situations.

To be fair, TC literature has accounted for this to a certain degree. Cousin (2008) proposed that teaching with threshold concepts should be about creating a relational and transactional space that will prompt the best outcomes from students. This means teachers create space for dialogue with students that can provide insight into "the nature of their understanding of particular phenomena in specific contexts" (Land et al., 2014, p. 215). Developing metaphors that mesh with student experiences leads to deeper, more meaningful teaching and learning. This takes time and negotiation because metaphors must be practical and plausible if they are to promote transformative learning. All of this means being in tune with students' wider social experiences and disciplinary interests.

Threshold Concepts in University Pedagogy: An Interdisciplinary Working Group Approach

Our interdisciplinary working group came together to formalize the informal campus discussions we had regarding pedagogical practices in our courses that transform student learning. Because all of us teach courses or hold workshops for first- and second-year university students in which we present material and methods of inquiry that we hope students will carry with them to other courses, our discussions started by exploring the ways in which high-road transfer can bridge academic contexts and foster long-standing mental habits that

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enable students to apply knowledge in new situations (see Blaauw-Hara, 2014). Our lead author, Blaauw-Hara, suggested that threshold concepts might be a productive avenue to explore and proposed a formal working group. This included regular group meetings (in-person and synchronous virtual), literature readings with facilitated discussion, asynchronous writing about our use of metaphor to introduce TCs which we reviewed collectively, independent presentations at faculty Pedagogy Series or Teaching & Learning fora that we all attended (when applicable) to add to our meeting discussions, and an analysis of the intersections between our ongoing pedagogical practices and TCs (through the investigation of our written pieces on TCs).

Currently, our interdisciplinary working group consists of five members with unique researcher positionalities. Blaauw-Hara's background is in first-year writing and writing program administration, two areas of study that place a high premium on understanding how students learn and supporting knowledge transfer across disciplines. Ibrahim is a mathematics and science education researcher exploring critical place-based pedagogy as a framing for learners to metacognitively connect learning to self, as an experience within community, grounded in culture and diversity, and situated in context/environments. Gerstle is a librarian whose interests as a researcher and educator lie in the rhetoric and communication of scientific information to multiple publics. Eaton is a writing teacher and scholar with an education background. He is interested in how student metacognition can facilitate knowledge transfer. Seeley has a background in linguistic anthropology, which, in its focus on language ideologies and diversities, overlaps with her current work teaching and researching academic writing. Our researcher positionalities, coupled with our research on threshold concepts in university pedagogy, served as an organic methodological approach to juxtapose literature and practice, leading to future research on more culturally responsive uses of TC and metaphor in higher education that link the diversity of our student body to our teaching.

In the section that follows, we suggest ways in which metaphor can be used to teach threshold concepts. We explore metaphor in two ways:

1. The ways in which metaphor can be used to foster transparency of metacognitive growth with respect to how learning happens, i.e., knowing/reflecting on liminal space of TC affordances and building capacity for self-awareness, self-regulation and self-directed learning. We present three metaphors—a video-game tutorial, a lakeside, and a conversation—that could be used to teach the concept of threshold concepts. These are meant to span disciplines and help students across the curriculum understand what threshold concepts are, with increased emphasis on liminality and metacognition.

2. The ways in which metaphors, when applied to discipline-specific concepts (e.g., number sense in mathematics), embody pivotal thresholds and transform learners' thinking/understanding of those disciplinary concepts. We present two examples of how metaphor can be used to help students learn specific disciplinary threshold concepts. We hope these examples will inspire readers to consider how they might use metaphor in their own disciplines.

New Metaphors for Threshold Concepts

Metacognitive Growth and Liminality

In these first three examples, we suggest how metaphors can help students understand what threshold concepts are on a macro level—in other words, not specific threshold concepts, but rather what threshold concepts are and, by extension, how they help us to understand what happens when people learn. All three examples emphasize liminality, agency, and individuality, acknowledging that learners learn in their own messy, unique patterns.

Your Quest Begins with the Tutorial (Eaton)

It is impossible to predict what will "click" for students—Adler-Kassner and Wardle (2015) discuss this—so selecting metaphors that offer the best opportunities to resonate with students' shared experiences is imperative. I often turn to common pop-culture examples to introduce the idea of a threshold moment. If students can grasp this, then they seem able to formulate their own metaphors that resonate with their lived experience and this can help them learn specific threshold concepts.

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Given the prevalence of video game play among university students, I have long drawn on video games to teach threshold concepts. The metaphors I pull from video game concepts seem to resonate with this crowd's interests and can often still be general enough for people who do not share an affinity for digital games. (They can often relate to learning board games or card games, especially the "practice round").

Video games often begin with a tutorial. The tutorial is designed much like a classroom and teaches crucial moves, concepts, and ways of interacting with the game world. The tutorial often creates a space where players are in the portal itself; it is a liminal space through which they must pass to perform in another game world. In role-playing games (RPGs) that occur in open worlds (where the player can select from a variety of different paths and sequences), these tutorials are separate from normal gameplay. Players come to the game with some background knowledge, they choose a character class, and they are inserted into a tutorial space that is separate from the game world itself. *The Elder Scrolls* (*Skyrim* and *Oblivion*) games fit this description. They are designed to expose players to a series of skills that will be useful in the game, they get players immersed in some small battles, and they introduce some lore that underpins gameplay.

However, the tutorials cannot predict the paths the player will take (neither can the player), so they are designed broadly to expose players to recurring situations they will encounter in the game and the skill sets they will require in those situations. Players are often uncertain about why they are learning a skill, and they often struggle to recognize how they will put a skill into action in the game. At the end of the tutorial, they face the end of the portal. Sometimes, this is literally a portal or passageway to the game world. The players must face the portal and pass through, not quite knowing how everything they learned clicks together until they've applied a concept in the game world itself. In a non-video-game context, this is like saying "so do you want to play for real this time?" and all the excitement, anxiety, and uncertainty that arises from that clause.

The specifics will change, but the tutorial is designed to help players learn the theory behind the game. They can then make connections as they encounter specific contexts within gameplay and combine skill sets to solve problems. In essence, the tutorials establish a foundation for threshold moments that will occur in the game as players make connections and gain more facility in navigating the world. Eventually, players pass from neophytes trying to grasp theory and apply it within the world to experts who have experienced enough to easily adjust to whatever situation they encounter.

I often use this metaphor to situate students in the journey they will encounter as they learn threshold concepts. They will learn many abstract and theoretical concepts to begin, but they will have opportunities to practice once they have passed through their learning portal. They will struggle at first, but the more they practice, the more they will make connections.

Eventually, they will connect their skill sets automatically to new scenarios. Making this explicit with the right metaphor can often help students embrace the challenge that begins a course and helps them adjust to the demands of thinking differently about a subject about which they already have deeply ingrained notions.

Once More (in)to the Lake (Blaauw-Hara)

If we all gathered on a lakeshore on a sunny, windy summer day, we could agree that if we were fifty meters farther inland, we would be on dry land. We could likewise agree that if we were fifty meters into the water, we would be in the lake. However, there would be robust debate about where the lake *actually* begins. Remember, it's a windy day, so small waves lap against the shore, sometimes covering the sand, and sometimes receding. Does that mean that the boundary between water and land is continually changing? If we stand where the waves lap over our feet, are we constantly shifting between being wet and dry, in the water and on land? Possibly. We could probably reach some sort of consensus through discussion, but we would not be able to share consensus of where the lake begins without talking about it.

Similarly, if we decided to walk into the lake, we could have a robust debate about when we were actually "in the lake." Some of us would likely take our time, maybe only wading up to our calves or knees. Others of us would surely take off pell-mell, throwing up great splashes as

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we ran as fast as we could into the water, finally diving under. Is the latter person more "in the lake" than the person who is wading? If the wader eventually goes for a swim, but it takes them a half hour to warm up to it, does the delay make them less "in the lake," or is all that matters that they eventually get there?

The most intriguing part of this metaphor is that it highlights the liminality of threshold concepts. We do not know exactly when we have "mastered" TCs, but it is likely that it does not happen all at once. The traditional doorway metaphor does not represent the liminal nature of how we learn TCs very well because it is very infrequent that we would pause in a doorway, or even take our time walking through. Once we decide to walk through, we do it.

However, there are many ways to enter a lake, and as demonstrated above, it can even be difficult to determine exactly where a lake begins. Threshold concepts are similar. Many of them are clear at first glance, but the closer we examine them, the fuzzier they become.

I think that many threshold concepts are like this: not clear doorways, where we can easily agree which side we are all on, but messy (and beautiful) lakeshores that have a vague boundary between water and land. The lake metaphor works for students because most have visited lakes at least some time, and most have also had the experience of being in a group where people entered the lake in different ways—slowly, pell-mell, or some way in between. Yet this difference does not mean that we never enter the lake, and the differences with which we all perceive and progress within TCs does not mean that TCs are not transformative. Whether we run into a lake or wade to our knees, we can all agree that we did not stay on dry land. The lakeshore metaphor represents the likelihood that our students will engage with TCs in a variety of ways, and that is OK, just like there is not only one right way to enter a lake.

The Threshold as Conversation (Gerstle)

In Library Science and Information Literacy Instruction (ILI), our interests do not especially lie in students' introduction to (and socialization into) a particular discipline. Rather, we are trying to provide TCs that may transfer across disciplinary boundaries to empower student learning in general. Our goal is to offer TCs that may be applied (ideally) everywhere, because they speak broadly about the nature of research, scholarship, and the evaluation of information. To this end, coming from Information and Library Science, the TC metaphor that I suggest as an alternative or supplement to Meyer and Land's (2006) portal is influenced by the fifth frame of the American Library Association's Framework for Information Literacy for Higher Education: Scholarship as Conversation. To quote the framework: "Communities of scholars, researchers, or professionals engage in sustained discourse with new insights and discoveries occurring over time as a result of varied perspectives and interpretations" (American Library Association, 2015, p. 20).

Unlike the portal metaphor, a learner's invitation to a conversation does not oblige them to reach an endpoint, fully grasping the idea at the journey's conclusion. Instead, the learner enters an ongoing communal event, which will add to—and transform—their present knowledge. Learners joining the conversation come to understand that knowledge is spoken and shared by individuals at various stages of contribution. They also understand that their own entry into the conversation will be gradual: they can listen to the ongoing interactions that reveal interactions of the past, witness the creation of new interactions, and practice the language of the conversation in preparation to contribute themselves.

Addressing the characteristics that Meyer and Land (2006) propose for threshold concepts, this metaphor prepares learners for the kinds of experiences they can expect to have as they enter their disciplines. Conversations are transformative: the individual is changed by the invitation to become a member, shifting from an isolated self to a participant in a community. The conversation transforms the learner, and it is also transformed by their joining. A conversation can also be viewed as irreversible: What is said in the conversation, whether accepted or challenged, remains in the realm of "what has been said." They are integrative in their capacity to immerse the learner in novel ideas, from across present contexts and over time. The conversation metaphor further attempts to equally address learners' introductions and socializations into all individual disciplines, and so works well as an easily understood metaphor of the threshold concept experience. Finally, a conversation may be troublesome: While a learner is

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invited to join, and their participation welcomed, an ongoing conversation is inevitably going to introduce viewpoints and opinions that challenge the learner's presuppositions. A "conversation" with oneself is safe because contradictions never arise.

In all, the conversation metaphor works well for the principles outlined by Meyer and Land (2006), and additionally affords the learner what they refer to as "liminal space": a newcomer to a community is allowed to practice its language, values, and worldview (p. 375). This said, the conversation metaphor suggests something beyond Meyer and Land's principles: that TCs are often learned and applied within disciplinary communities and through the interactions and "conversations" of those communities (e.g., papers, conferences, emails, informal chats, etc.).

To that end, the conversation metaphor also helps us to foreground the disciplinary nature of knowledge construction and to account for the social and cultural epistemologies embedded in the knowledge we teach. This is particularly important given the epistemologies that have, historically, been silenced, negated, or intentionally erased. In questioning knowledge hierarchies—along with their attendant ideologies—educators can better reimagine the subject matter they teach in ways that speak to the rich diversity of perspectives reflected across their classrooms. In this way, the learner has agency not only to contribute meaningfully to the community, but also to critique it. That is, conversations are typically selective affairs, including some and excluding others. Some members are given the opportunity for loud and lasting voices, while others are discouraged from speaking or silenced entirely. In this sense, the learner joins the community and can further criticize knowledge production that is based on unequal power structures.

Discipline-Specific Concepts

The next two examples focus on how metaphor can be used to teach discipline-specific threshold concepts. While it is certainly possible that readers will be able to use these exact metaphors in their own courses, we mainly provide these examples to demonstrate how metaphor can be used to illuminate and explain difficult subject matter. In each example, the metaphor helps students not only understand the concept itself, but how learners possess agency and participate in their own learning. We

encourage readers to develop additional metaphors of their own, and we provide suggestions for how to do so in the last section of this article.

The Joke that Falls Flat (Seeley)

In the same way that pop culture metaphors tend to resonate with students, extending comparisons to familiar social contexts can also be useful. In writing courses, I sometimes introduce a joke metaphor with the goal of making the idea of conversational inquiry more plausible for students writing arguments. To do this, I draw on foregrounding theory (Shklovsky, 1965). This is a set of ideas that, at its core, suggests that some social information is more visible and therefore more readily accessible than other kinds of social information. These degrees of visibility are, further, shaped by one's positionality.

To set up the joke metaphor, we must establish a distinction between automatized and foregrounded language. When language is automatized, its referential, semantic, and indexical functions are tightly bound together, and social meanings become habitual and unproblematic. A good example of automatized language is small talk and its unambiguous conversational coherence. People typically do not ask themselves "what did they mean by that?" when someone asks how they are doing during a casual social encounter. In contrast, when language is foregrounded, we see the opposite: a linguistic form is made to stand out against the perceived norms of "ordinary" social life, which calls perceived mutual agreement into question. In other words, one might become disoriented if, after asking about another person's well-being during a casual social encounter, that other person replied by asking, "What do you care?" This disruption would prompt the reevaluation of communicative expectations because otherwise unexamined ideologies surrounding politeness would have been thrust into the foreground of participants' attention.

With all this in mind, we can introduce the joke scenario in the classroom. We might start by asking students to imagine a group of friends standing around chatting. During this conversation, one person tells an ableist joke and laughs heartily.[1] Perhaps one of the listeners is caught off guard and laughs nervously or narrows their eyes in disbelief. Perhaps a second listener responds by

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calling out the joke for what it is: ableist, toxic, hurtful, etc. Perhaps a third listener tries to read everyone's faces and finds the whole situation confusing because of the incongruent reactions. Here, the second listener's call-out foregrounds (and problematizes) the ableist ideology— one that we now know is not uniformly shared among all people participating in the conversation. Students typically have no trouble recalling—and sharing—their own prior experiences with this kind of incongruence. Once they have had an opportunity to reflect and share, I move on to draw parallels between the joke scenario, processes of learning, and those of writing.

Most students need time to fully conceptualize scholarly writing practices as a form of conversational inquiry. The joke metaphor is helpful here for several reasons. First, students can typically relate to scenarios where people are struggling to understand the wider social contours of a conversation and establish their place within it. They can often recall a time when they were, themselves, confronted by a public display of a distasteful ideology. They can often also recall how they needed time to process that social situation. As such, one value of this hypothetical joke scenario lies in its potential for introducing the notion of liminality—if not thrusting students into a liminal space. Life regularly requires us to process social information and craft our identities and values in relationship to that information. This shifting, life-long process of meaning-making is often characterized by periods of liminality. Learners already experience this back-and-forth in their personal lives, so invoking that fact can help to normalize the back-and-forth they may experience as learners.

Second, students readily understand joking as a social act. On the other hand, they do not so readily understand writing as a social act (e.g., Roozen, 2015; Bazerman, 2015). That is, the joke situation is familiar, and, with some unpacking, it becomes resonant as a metaphoric "source." In overtly examining oral communication— joking or otherwise—as a social, audience-oriented act, students are more readily able to conceptualize writing as a similarly social, audience-oriented act. That is, students learn to recognize that their readers may think differently from them and that they may need to orient their arguments in ways that account for or "get ahead of" instances where their ideologies and interpretations may be incongruent with those of their readers. For

young people who struggle with writing, this parallel can be empowering.

Finally, the joke metaphor, along with its "circle of friends" imagery, can enliven a non-linear liminal space. As such, it can oblige some learners to recall and envision threshold moments from their own social past—and identify threshold moments in their own educational present. Just as social actors must "read" social contexts, writers must tailor their practice in a way that accounts for their audience—if they don't want the joke to fall flat.

Numbers are Connected to Bodies (Ibrahim)

Our math identity is often so ingrained that we never recognize it as evolving, changing, and as being constructed through learning experiences, social power, and cognitive shifts. It is commonplace to make statements like "I'm not a math person," or "I've always been good at math." When enrolling in a numeracy course or a mathematics education course, many learners enter with a series of anxieties and apprehensions towards mathematics, while other learners come to the course excited to continue learning a subject in which they have always excelled. In response, I try to share ways of thinking that provoke critical and deep reflection on the nature of mathematical concepts. The threshold concept that students need to understand is the complexity of mathematical ideas and the myriad features that cognitively and socially construct how one might approach mathematics as a subject and/or how they solve mathematical problems. A by-product of traversing that threshold concept is students' awareness of the potentiality of "doing math": one that negates a prescribed formulaic and singular solution but that instead spans across a diversity of thinking to solving math problems. Thus, stuck math identities move from their static position into a liminal space where students are transformed. They begin to realize that any math problem is approachable at any skill level and solving it simply requires grit, willingness, collaboration of thought, and flexibility.

To illustrate this, I use a lesson on number systems and their connection to human bodies to help students grasp the threshold concept that math epistemologies are socially constructed. In an effort to find ways to measure or count really large quantities of things, and communicate that in a more aesthetically pleasing

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format, communities historically came up with number systems. For example, the Oksapmin people of New Guinea adopted a base 27 counting system, which seems unusual for students since our Western and Eurocentric training assumes a base 10 counting system is the only one that exists, one adapted from the easy way we can count from 1-10 using our fingers. In contrast, the New Guinean system starts with the thumb on one hand counting body parts towards the nose and then down the other side of the body ending with the pinky on the other hand (Figure 1).

In sharing this threshold concept, I aim to provoke thinking by asking how we might move beyond the logic of preserving, of keeping, of holding Western and Eurocentric mathematical concepts as the epitome of mathematical knowing. Instead, we expand our thinking to value mathematical epistemologies from other contributors to mathematical expression and thought, and the roles language and culture play in that. The colonial erasure of number systems that live beyond the Western or Eurocentric epistemologies becomes a turning point for learners and they realize that knowledge in mathematics is socially constructed. This includes the realization that their early learning taught them formulaic foundations, but now creativity in mathematics is almost imperative in solving some of the most complex and arduous math problems in our time and in the future.

The embodied learning of relating number sense to our bodies is an interesting one. The identity markers that guide the way that we inhabit our bodies influence learning. A metaphor that may be useful and resonant with this understanding is an actor learning a character. Bit by bit, as the actor dons new clothing, adopts a new accent, spends time in the hair and make-up chair, the actor finds a new identity to perform, experimenting with a worldview and way of being in the world that is very different from how they are off-camera or off-stage. Thinking of embodiment as it connects to threshold concepts might function similarly: Apprehending new threshold concepts in mathematics can involve thinking about what it might be like to inhabit a different body, or at least to think of their own bodies differently.

As learners, the knowledge we attain is embodied and accepted as inherently true because one lives it as

part of the fabric of their being despite how arbitrary that knowing can be. The way we count shapes our reality, but things could be—and often are—different. A student learning about hegemony of body types may come to see that they have been living a way that obliges them to think about themselves in terms of this ideology (e.g., dress sizes). The TC is a means of transforming this embodiment, freeing the learner to think about and live reality in new ways and becoming cognizant of social constructions of mathematical knowledge.

Suggestions for Implementation

SoTL's emphasis on threshold concepts over the past decade and a half underscores the utility of the framework for both curriculum design and direct communication with students about their learning. It is rare that such a framework emerges that is truly cross-disciplinary and provides utility for faculty and students across the curriculum. As we have attempted to illustrate, the framework is generative for each of us, despite the diversity of our academic preparation and the ways we work with students. Certainly, the purpose of this article is not to challenge the idea of threshold concepts, but rather to suggest ways its portal metaphor may fall short in suggesting the full scope of student engagement with the ideas at the heart of a discipline, and to engage with how metaphor might help students understand not only disciplinary threshold concepts, but the very concept of threshold concepts itself. Moreover, we hope to underline the fact that the metaphors we use to teach TCs can open (or close) pathways to accounting for diversity within our classrooms. By way of conclusion, we will now offer some practical recommendations to consider when adapting and creating metaphors for learners across the disciplines. We also include a brief exercise that might help others create metaphors for threshold concepts in their disciplinary and institutional contexts.

Integrating the Metaphor and Accounting for Liminality

Threshold concepts are teaching tools, not simply core concepts that define core disciplinary knowledge. Strong metaphors should be embedded in the overarching fabric of a course. It is beneficial to ask how the metaphor connects to core learning objectives, make those objectives overt to students, and deliberately weave the metaphors you select into many elements of your course.

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Interleaving the metaphor through several course lessons and activities offers students multiple opportunities to grapple with the ideas and immerse themselves in the liminality. Similarly, we believe that acknowledging a learner's social background and positionality is relevant for understanding and/or supporting their individual processes of sense-making as they traverse liminal spaces. This, combined with sustained immersion, offers them several opportunities to encounter their own threshold moments and apply what they have learned. Thinking past the doorway entails more than a metaphoric shift. It obliges us to cultivate an expansive liminal space, which requires purposeful instructional realignments.

### Preparing Students to Think Deeply in Their Disciplines

Ideally, the metaphor positions students to think about themselves as contributors to your discipline. The metaphor should get them thinking deeply about how the concept applies to the discipline and how they can apply the concept to their own contribution to the discipline. To set students up for this metacognitive thinking, it is often beneficial to get them to reflect on how the metaphor and its underlying threshold concept connect to how students contribute knowledge in the discipline. This reflective work could be implemented in several ways, including a short reflective assignment, a brief reflective activity/prompt at the end of the class, or even a concept quiz to begin a lesson that reflects on previous knowledge.

Determining the Need for New Metaphor(s)

Furthermore, how does an educator determine when the situation is appropriate to introduce a new metaphor? When students struggle with a threshold concept, a fresh metaphor might help them visualize the process they are experiencing in an engaging and perhaps even entertaining way. But how does one assess whether a new metaphor would benefit a student struggling to "get it"? As information scientist Meaghan Oakleaf (2014) comments, "While Meyer and Land's limited literature on the assessment of threshold concepts does not provide substantial, detailed guidance, it does demonstrate their belief that threshold concepts are assessable" (p. 511). Oakleaf argues that TC acquisition can be assessed as a learning outcome by (1) providing feedback to help students in "stuck places" and (2) making provisions for the different routes that students might use to "get it." In this sense, the need for a variety of metaphors is clear.

The space past the threshold is not only a place of knowledge acquisition or learning, but instead a place that opens the learner up to the complexity of knowing where deeper contemplation, research, study, questioning, and connecting can happen. Accordingly, threshold concepts—and their metaphors—must account for diverse generational, cultural, and linguistic resources if we want to mesh learners' lived experiences, social familiarities, and disciplinary pursuits. These pursuits are central to the purpose of university pedagogy, and our collective work will surely benefit from closer attention

Figure 1
New Guinean Counting
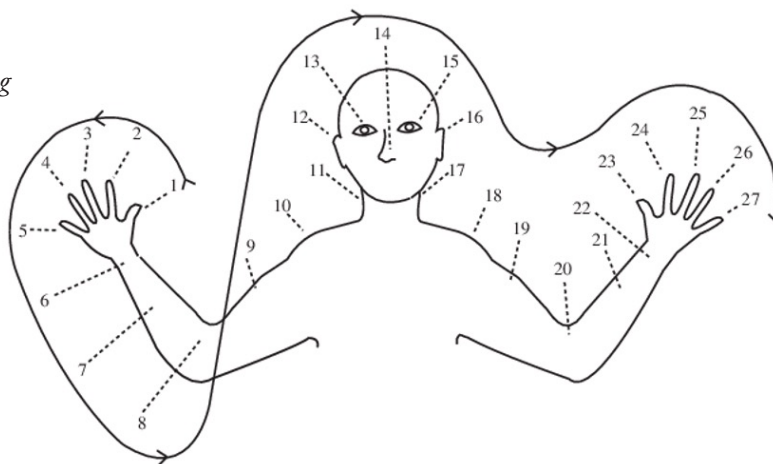
Note. Reproduced from Saxe (2015).

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Constructing New Metaphor(s): A Brief Exercise

Creating new metaphors to teach threshold concepts requires thinking not just about the metaphor but also about how it will function in a course. We engaged in a faculty workshop—either as a leader or a participant—that focused on metaphor development and pedagogical application. This workshop used four steps—identify, conceptualize, consult, integrate—to develop metaphors and map how they could be implemented in the classroom. We outline these four steps since others might find them useful or adapt them for their own practice.

Step 1: *Identify* a core disciplinary concept that students must grasp to fully participate in the knowledge-building practices of that discipline. It could be instructive for faculty to reflect on a concept they teach frequently. The exercise can offer a new lens through which they can view their pedagogy.

Step 2: *Conceptualize* possible metaphors. Brainstorm at least two possible new metaphors and consider the following questions: how does the metaphor communicate the concept? How might learners relate to the metaphor, and how long might it take learners to make the connection between the metaphor and its underlying concept? The first question helps to link the metaphor's tenor to its vehicle. The second question places student learning at the center of the metaphor. It is natural for students to need time to make the connection between the metaphor and the concept. It should not, however, be overly complicated for them to begin making connections. The metaphor is supposed to facilitate learning, not obscure it.

Step 3: *Consult* with others. Testing a metaphor with colleagues who share pedagogical and research interests can be instructive. These conversations often reveal the finer details that refine the metaphor from its draft stage to its use in the classroom.

Step 4: *Integrate* the metaphor into the course plan. The metaphor is most effective when it weaves in and out of lessons, units, or assignments. At this stage, it is important to consider how the metaphor will be first introduced; the first impression matters. Then it is important to identify areas where the metaphor

might be reinforced by connecting it to different moments where the concept might be useful to help students understand and apply course material.

In proposing the preceding ideas and activities, we hope to underline the value of inter-/cross-disciplinary conversations in determining what might be the best ways to create transformative learning experiences for our students. We believe these conversations will yield meaningful pedagogical reflection and assist educators in developing socioculturally responsive learning materials.

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Footnotes

[1] I happen to use this discussion as an opportunity to problematize ableist discourse within my own classroom, but invoking the notion of any kind of offensive joke would serve the same purpose.