

Taylor Institute  
Guide Series #1

# THRESHOLD CONCEPTS



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The theoretical framework of threshold concepts has become an emerging line of inquiry across all academic disciplines and areas of research, particularly in the scholarship of teaching and learning. The notion of a threshold concept arose out of research by Jan Meyer and Ray Land, who define it as a core idea that's conceptually challenging for students, who struggle to grasp it—but once grasped, it radically transforms the students' perception of the subject. Although this material is difficult to learn, understanding threshold concepts is essential to the mastery of any field of study.

Since Meyer and Land's foundational article in 2003, research surrounding threshold concepts has proliferated, leading scholars to new lines of inquiry in their study of threshold concepts. While some researchers focus on the application of threshold concepts in their individual disciplines, other researchers are adding new branches to the theoretical framework of threshold concepts. As a relatively new field of study, threshold concept theory is continuing to blossom as a generative and productive approach to studies of higher education.

## Primary Characteristics

According to Meyer and Land in their foundational essay "Threshold Concepts and Troublesome Knowledge: Linkages to Ways of Thinking and Practising within the Disciplines" (2003), a threshold concept acts as a conceptual gateway or portal that unsettles the learner and then, hopefully, opens up new ways of approaching subject matter. Their essay outlines the primary characteristics of threshold concepts: they are troublesome, transformative, irreversible, integrative, and bounded.

### ***Troublesome***

Threshold concepts are characterized by their complexity, but the dominant discourse surrounding threshold concepts focuses on the *troublesome* nature of these concepts as an essential characteristic, regardless of the field of study. Meyer and Land use David Perkins's research on "troublesome knowledge" as their point of departure, noting that threshold concepts involve alien knowledge (knowledge that is unfamiliar) and counter-intuitive knowledge (knowledge that contests what a student has already mastered). These concepts are fundamentally troublesome in that encountering them is challenging and unfamiliar, and mastery doesn't simply progress from "difficult" to "easy" but instead involves a continual struggle. A student may even feel hostile towards threshold concepts because of the discomfort involved in the transformation. *Overcoming Barriers to Student Understanding: Threshold Concepts and Troublesome Knowledge* (Meyer & Land, 2006) provides a focused examination of the troublesome quality of threshold concepts through a diverse range of essays, examining both the theory and the practical applications.

### ***Transformative***

According to Meyer and Land, threshold concepts offer the potential for *transformation* in their facilitation of student learning. As suggested in the metaphor of the threshold, once students understand or cross it, their perceptions of the discipline are permanently altered. This new knowledge also results in an ontological shift, resulting in transformed attitudes, values, or understandings. Through shift, students move from the pre-liminal space of learning, through liminality, to the post-liminal space of mastering a threshold concept. Julie Timmermans' 2010 article "Changing our Minds: The Developmental Potential of Threshold Concepts" closely examines

the metamorphosis activated by threshold concepts, emphasizing the “*process of learning*” rather than “the *outcomes*” (3). She asserts that scholars should focus on the continuing transformative potential and process of threshold concepts, rather than the acquisition of this knowledge.

### ***Irreversible***

Premised on the transformative potential of threshold concepts, Meyer and Land also claim that the transformative potential of threshold concepts also mean that they are potentially (but not definitively) *irreversible*, suggesting that this knowledge is unlikely to be unlearned. Meyer and Land’s unassertive language here reflects the scholarship describing such regression (a reconsidered characteristic outlined below) as a facet of student learning.

### ***Integrative***

Understanding a threshold concept renders the connectedness of the subject matter visible, leading students to recognize how threshold concepts are *integrated* into a wider body of knowledge. After crossing the threshold, students will be able to connect different aspects of the subject, forming a new matrix of knowledge that was not initially apparent. This integrated nature of threshold concepts speaks to how these difficult concepts are critical for the mastery of the subject: if not understood, threshold concepts may snowball, leading to further conceptually difficult material and compounding the troublesomeness of learning.

### ***Bounded***

Threshold concepts may circumscribe a particular conceptual field, creating a specific space of expertise within each discipline. Meyer and Land use hesitant language again in their description of the *bounded* quality of threshold concepts, stating that they are “Possibly often (though not necessarily always) bounded in that any conceptual space will have terminal frontiers” (“Linkages” 2003). Although “boundedness” is a foundational characteristic of threshold concepts, it is not as frequently discussed as the other four qualities.

## ***Resources***

### **General Introductions to Threshold Concepts**

Cousin, Glynis. “An Introduction to Threshold Concepts.” *Planet*, 17 (2006): 4-5. Web.

---. “Transactional Curriculum Inquiry: Researching Threshold Concepts.” *Researching Learning in Higher Education: An Introduction to Contemporary Methods and Approaches*. New York: Routledge, 2009. 201-212. Print.

Elon University Teaching and Learning Technologies. “Ray Land: Threshold Concepts and Troublesome Knowledge.” Online video lecture. *Youtube*. 23 Feb. 2012. <https://youtu.be/WR1cXldWnNU>

Tight, Malcolm. “Theory Development And Application in Higher Education Research: The Case of Threshold Concepts.” *International Perspectives on Higher Education Research*. Eds. Jeroen Hulsman and Malcolm Tight. Vol. 10. New York: Emerald Group Publishing, 2014. 249-267. Print.

### **Foundational Essays (in order of publication)**

Meyer, Jan, and Ray Land. “Threshold Concepts and Troublesome Knowledge: Linkages to Ways of Thinking and Practising within the Disciplines.” *Enhancing Teaching- Learning Environment in Undergraduate Courses Project*. 4 (2003): 1-12. Web.

Often cited as the foundational text for threshold concepts, Meyer and Land's 2003 article outlines the origins and characteristics of threshold concepts, which they define as concepts that act as a conceptual gateway or portal that opens up new ways of approaching subject matter. After providing examples of threshold concepts across disciplines, Meyer and Land detail the characteristics of threshold concepts: transformative, irreversible, integrative, bounded, and troublesome. Pointing to Perkins' work on forms of knowledge, Meyer and Land state that threshold concepts align with troublesome knowledge, which is conceptually difficult, alien, and tacit. They also note that introducing threshold concepts in the classroom may lead students to feel unsettled by this new knowledge and perspective. Finally, they emphasize that this article is not definitive in the exploration of threshold concepts, but instead opens up questions for further lines of inquiry.

Meyer, Jan, and Ray Land. "Threshold Concepts and Troublesome Knowledge: Epistemological Considerations and a Conceptual Framework for Teaching and Learning." *Higher Education*. 49 (2005): 373-388. Web.

Building on their previous research (2003), Meyer and Land attempt to locate threshold concepts in discipline-specific language. They also develop their conception of "liminality," or the state of in-betweenness that threshold concepts often invoke for students. Rather than arriving at a fixed point, threshold concepts lead to transformative liminality. The authors argue that threshold concepts open up new discourses for students, which can transform students' identity. Students also can experience being "stuck" and may reach for a coping strategy when they feel overwhelmed by threshold concepts: mimicry, or using the language of threshold concepts without understanding it or undergoing a transformation. The authors call upon researchers to devise methods of inquiry to answer why some students struggle with threshold concept acquisition and become stuck, while others do not.

Land, Ray, Cousin, Glynis, Meyer, Jan, and Peter Davies. "Threshold Concepts and Troublesome Knowledge (3): Implications for Course Design and Evaluation." *Improving Student Learning: Diversity and Inclusivity*. Chris Rust, ed. Oxford: Oxford Centre for Staff and Learning Development. 2005. 53-64. Web.

This paper dives into how threshold concepts impact course design. The discussion of this new approach is subdivided via the following lenses: "Jewels of the Curriculum," "The Importance of Engagement," "Listening for Understanding," "Reconstitution of Self," "Tolerating Uncertainty," "Recursiveness and Excursiveness," "Pre-Liminal Variation," "Unintended Consequences of 'Good Pedagogy,'" and "The Underlying Game." Land, Cousin, Meyer, and Davies then turn to the application of threshold concepts through an empirical case study on first-year undergraduate students and their acquisition of new knowledge.

Meyer, Jan, and Ray Land. "Threshold Concepts and Troublesome Knowledge: Issues of Liminality." *Overcoming Barriers to Student Understanding: Threshold Concepts and Troublesome Knowledge*. Jan Meyer and Ray Land, eds. New York: Routledge, 2006. 19-32. Print.

This foundational text provides the first sustained examination of the liminal quality of threshold concepts, a quality that Meyer and Land only briefly touched on in their 2003 publication. This topic focuses even further on the *process* of learning. They assert that a "praxis of stuck places" (Lather 1998) will allow higher education scholars to understand how and why students experience extreme discomfort in liminal spaces and will offer "rich possibilities for future research" (31).

Meyer, Jan, Land, Ray, and Peter Davies. "Threshold Concepts and Troublesome Knowledge (4): Issues of Variation and Variability." *Threshold Concepts within the Disciplines*. Rotterdam: Sense Publishers, 2008. 59-74. Web.

This article explores the variations in students' struggles with conceptually difficult material. The authors suggest that the pre-liminal, liminal, post-liminal, and sub-liminal stages of learning must be assessed in order to understand how and where students encounter difficulty. They also write about approaches to pedagogy that will facilitate students' understanding of troublesome knowledge.

Land, Ray. "There Could Be Trouble Ahead: Using Threshold Concepts as a Tool of Analysis." *International Journal for Academic Development* 16.2 (2011): 175-8. Web.

Speaking to the developments in work on threshold concepts, Land provides a "state of the field." In outlining the new approaches, he claims that higher education requires new conceptual lenses and modes of analysis to reveal "different ways forward" (176), suggesting that research into threshold concepts fulfills this new perspective.

Meyer, Jan. "Variation in Student Learning' as a Threshold Concept." *Journal of Faculty Development* 26.3 (2012): 8-13. Web.

After providing an overview of threshold concepts, Meyer outlines her focus on faculty development, where faculty must relocate themselves as students. Meyer discusses at length the ways in which faculty development is a threshold concept for faculty, as they are forced to transform their approaches to teaching, learning, and their pedagogical practice.

### Subsequent Considerations of Primary Characteristics (in order of publication by characteristic)

#### Troublesome

Perkins, David. "The Many Faces of Constructivism." *Educational Leadership*, 57.3 (1999): 6-11. Web.

In their work on threshold concepts, Meyer and Land (2003) draw on Perkins' notions of "conceptually difficult" or "foreign knowledge" that students find hard to grasp.

Perkins, David. "Constructivism and Troublesome Knowledge." *Overcoming Barriers to Student Understanding: Threshold Concepts and Troublesome Knowledge*. Meyer, Jan, and Ray Land, eds. New York: Routledge, 2006: 33-48. Web.

Perkins explores the troublesome nature of threshold concepts through episteme, which he defines as "the underlying game," a way of knowing or a system that allows students to establish knowledge. Perkins advocates a constructivist approach to learning, asserting that educators must help students "not simply to know about the game but to play the game knowingly" (40).

Rhem, James. "Thresholds are Troublesome." *The National Teaching and Learning Forum*, 22.4 (2013): 1-5. Print.

Through interviews with Ray Land and Jan Meyer, Rhem explores the various ways in which threshold concepts are troublesome. He highlights the various "troublesome" language that circulates around threshold concepts, including "emotional capital" (Glynis Cousin), "nettlesome knowledge" (William Thompson), and David Chase and Joan Middendorf's "bottlenecks." Rhem addresses the various barriers that students can encounter and what faculty can do about their students' struggles. He asserts that threshold concepts, and specifically their troublesomeness, represent the "core challenge of higher learning" (5).

#### Transformative

Timmermans, Julie. "Changing our Minds: The Developmental Potential of Threshold Concepts." *Threshold Concepts and Transformational Learning*. Eds. Jan Meyer, Ray Land, and Caroline Baillie. Rotterdam: Sense Publishers, 2010. 3-21. Web.

Timmermans examines the changes brought about by threshold concepts, focusing on the "process of learning," rather than "the outcomes" (3). She asserts that scholars should focus on the continuing transformative potential and process of threshold concepts, rather than the acquisition of this knowledge.

Malkki, Kaisu and Larry Green. "Navigational Aids: The Phenomenology of Transformative Learning." *Journal of Transformative Education*, 12.1 (2014): 9-24. Web.

Employing a first-person point of view, Malkki and Green examine the existential challenges and transformative process of learning through micro-processes. They assess notions of liminality, comfort-zone, and edge emotions to understand students' experiences of transformation.

## **Additional Characteristics**

While the five characteristics originally outlined by Meyer and Land persist as the dominant and primary characteristics, other nodal points of threshold concept theory have been identified. Analyses of threshold concepts now address issues of recursion, discourse, identity reconstitution, liminality, and mimicry.

### ***Recursive***

Questioning the irreversible quality of threshold concepts, numerous scholars—including Meyer and Land—have now suggested that the learning process for threshold concepts is recursive: rather than linear movement, it involves revisions and recursions as students may digress and have to revisit the challenging material (Land, Cousin, Meyer, & Davies, 2005). Indeed, from the first moment of encountering troublesome knowledge, students don't simply move from integration of threshold concepts to permanent transformation. Instead, this learning is a "messy journey" involving oscillations between mastery, understanding, and confusion (Cousin, 2006, p. 2).

### ***Discursive***

Language plays a pivotal role in this learning process. The shift in knowledge is accompanied by a discursive shift: new forms of discourse or language reflect the students' internalization of the threshold concept. The acquisition of the threshold concept runs parallel to the acquisition of new language, the language of expertise. This discursive shift is thus tied up with the transformative and irreversible qualities of a threshold concept.

### ***Identity Reconstitution***

Threshold concepts' transformative potential and ontological shift leads to a reconstitution of the learner's identity: "New understandings are assimilated into our biography, becoming part of who we are, what we see, and how we feel" (Cousin, 2009, p. 202).

### ***Liminality***

Liminality—a state of ambiguity, uncertainty, or in-betweenness—is a highly active line of inquiry in higher education studies. When students are first introduced to threshold concepts, they may move into "a suspended state of partial understanding" (Meyer, Land, & Baillie, 2010). This partial understanding is the experience of liminality, the unstable product of the troublesome nature of threshold concepts. While some students may pass through the liminal space with relative ease, other students become stuck between the preliminal state and the mastery of the concept, unable to reconcile the conflict of new and old knowledge and potentially resulting in profound anxiety. This characteristic has led to a greater focus on the affective and uncomfortable dimensions of learning.

### ***Mimicry***

Mimicry highlights the troublesome quality of threshold concepts. In the liminal state, students may attempt to mimic knowledge without having fully grasped it, particularly by attempting to use the discourse of expertise without the knowledge of expertise. Mimicry is a product of frustration and a coping strategy for those who are overwhelmed by threshold concepts.



## Resources

### Additional Characteristics of Threshold Concepts (in order of publication by characteristic)

#### Identity Reconstitution

Blackie, Margaret, Case, Jennifer, and Jeff Jawitz. "Student Centredness: the Link between Transforming Students and Transforming Ourselves." *Teaching in Higher Education*, 15.6. (2010): 637-646. Web.

This article explores student-centred approaches to pedagogy as a threshold concept. The authors assert that educators must acknowledge students as people and that the students' subjectivity is paramount to the learning experience. Blackie et al. suggest that educators who recognize students' subjectivities and foster the transformation of students' identities undergo their own transformations.

Stibbe, Arran. "Identity Reflection: Students and Societies in Transition." *Learning and Teaching in Higher Education*, 5 (2011): 86-95. Web.

Placing identity theory in conversation with transformational pedagogy, Stibbe explores sustainability as a threshold concept. He asserts that educators must encourage students to take a more active role in shaping their identity throughout the learning process. He argues that students' identities are permanently transformed once they reflect on their own subjectivity and relationship to the world around them.

#### Liminality

Land, Ray, Rattray, Julie and Peter Vivian. "A Closer Look at Liminality: Incorrigibles and Threshold Capital." *Threshold Concepts: From Personal Practice to Communities of Practice*. (2014): 1-12. Web.

Drawing on earlier research and publications on threshold concept liminality, this paper first defines the nature of liminality through space theory, then turns to exploring liminality as a conceptual and ontological space. Land, Rattray and Vivian apply "psychological capital," or the positive psychological development (abbreviated as PsyCap), to threshold concepts to understand the struggle students have with moving through liminality. PsyCap is characterized by self-efficacy, optimism, hope, and resilience. This paper suggests that PsyCap allows students to successfully negotiate the liminal state and undergo ontological change, despite the difficulties in learning. Land, Rattray, and Vivian conclude that educators must implement positive psychology as part of their pedagogical duty to assist students with encountering the discomfort of liminal spaces.

Land, Ray, Rattray, Julie and Peter Vivian. "Learning in the Liminal Space: A Semiotic Approach to Threshold Concepts." *Higher Education*. 67 (2014): 199-217. Web.

Pointing to the gap in research on liminal space and threshold concepts, the authors explore the spatial metaphor of liminality through diagrams and the connection to semiotic theory. Attempting to gain insight into the challenges of students, they further apply semiotic analysis to pedagogical content knowledge, defined as the distinctive bodies of knowledge in teaching. Through an analysis of liminal space, Land et. al. attempt to understand further why some students struggle to negotiate liminality. Approaching threshold concepts semiotically, they argue that all encounters with threshold concepts have a discursive challenge. Turning away from troublesome knowledge as a "threshold" concept, Land et. al. implement the image of the tunnel. Their research is innovative in its use of visualizations and the deployment of semiotics to articulate the liminality of threshold concepts.

## Criticisms

While many scholars have embraced threshold concepts as a valuable and productive area of study for teaching and learning, there have been a few notable criticisms. Rowbottom (2007), for instance, asserts that despite the discourse circulating in the field, scholars have failed to effectively

define threshold concepts and are thus unable to identify them. He focuses on the weak descriptions of the qualities of threshold concepts as well as the broad use of the word “concept,” leading to broad and elusive definitions. He also suggests that threshold concepts are always relative: knowledge that is troublesome and transformative for one student may be neither for another student. O’Donnell (2009) describes the notion of threshold concepts as reductive, claiming that it oversimplifies fields of research into a set of core beliefs and negates the overlapping characteristics in different areas of study. Barradell and Kennedy-Jones (2013) criticize the attention to threshold concepts, pointing out that the scholarly focus has been more on identifying threshold concepts than asking how they function or why they matter.

## Resources

### Criticisms of Threshold Concepts (in order of publication)

Rowbottom, Darrell. “Demystifying Threshold Concepts.” *Journal of Philosophy of Education*, 41.2 (2007): 263-270. Web.

Rowbottom critiques threshold concepts, arguing that scholars have failed to effectively define threshold concepts and are thus unable to identify them. He focuses on the weak identification of the qualities of threshold concepts, resulting in broad and elusive definitions.

O’Donnell, Rod. “Threshold Concepts and Their Relevance to Economics.” *ATEC: 14th Annual Australasian Teaching Economics Conference*. (2009): 190-200. Web.

Applying threshold concepts to his field of study, O’Donnell asserts that the theory of threshold concepts is reductive in that it oversimplifies disciplines into a set of core beliefs.

Quinlan, K., Male, S., Baillie, C., Stamboulis, A., Fill, J. and Z. Jaffer. “Methodological Challenges in Researching Threshold Concepts: A Comparative Analysis of Three Projects.” *Higher Education*, 65.2 (2013). Web.

Quinlan et. al. assert that the research methodology on threshold concepts is weak and incomplete. They assert that rigorous protocols for the research of threshold concepts must be established and explicit. They conclude that identifying threshold concepts is unproductive and essentialist.

Barradell, Sarah. “The Identification of Threshold Concepts: A Review of Theoretical Complexities and Methodological Challenges.” *Higher Education*, 65.2 (2013): 265-276. Web.

By examining the identification of threshold concepts across disciplines, Barradell points to the challenges in this process. She argues that the lack of involvement of the professional and public community in the dialogue on threshold concepts is a problematic gap and argues for voices outside the educational community. Barradell’s other critique hinges on the lack of agreement on the identification of threshold concepts in various disciplines. She insists that implementing “consensus methodology,” or collaborative agreement, will allow for the specification of what constitutes threshold concepts in each discipline.

Barradell, Sarah, and Mary Kennedy-Jones. “Threshold Concepts, Student Learning and Curriculum: Making Connections between Theory and Practice.” *Innovations in Education and Teaching International* 52.5 (2013): 536-45. Web.

Barradell and Kennedy-Jones criticize the current research on threshold concepts, stating that scholars have been too focused on identifying threshold concepts and not asking how threshold concepts function or why they matter.

## Applications

Threshold concepts have been identified and applied across a wide range of disciplines, including economics (Meyer and Land's field), biological sciences, computer science, health care, social work, law, literature, engineering, and business, as well as specific areas such as doctoral studies, information literacy, and academic writing. Land points to the significant interest in threshold concepts across disciplines, pointing to "over 150 scholarly papers in 80 disciplinary or subject contexts" (2011, p. 77). See "Explorations of Threshold Concepts in the Disciplines" for a sampling of references.

### Resources

#### Threshold Concepts in Context

##### Accounting

Lucas, U. "Worlds Apart: Students' Experiences of Learning Introductory Accounting." *Critical Perspectives on Accounting*, 11.4 (2000): 479–504. Web.

Lucas, U. & Meyer, J. "'Towards a Mapping of the Student World': The Identification of Variation in Students' Conceptions of, and Motivations to Learn, Accounting." *The British Accounting Review*, 37.2 (2005): 177–204. Web.

Lucas, U. & Mladenovic, R. "Developing New World Views: Threshold Concepts in Introductory Accounting." *Overcoming Barriers to Student Understanding: Threshold Concepts and Troublesome Knowledge*. Eds. Jan Meyer and Ray Land. London: Routledge, 2006. 148-159. Web.

##### Biological Sciences

Bryan, Jacalyn, and Elana Karshmer. "Using IL Threshold Concepts for Biology: Bees, Butterflies, and Beetles." *ACRL College and Research Libraries News*, 76.5 (2015): 251-255. Web.

Johnson, C., Middendorf, J., Rehrey, G., Dalkilic, M., and K. Cassidy. "Geological Time, Biological Events and the Learning Transfer Problem." *Journal of the Scholarship of Teaching and Learning*, 14.4 (2014): 115-129. Web.

Wolf, A., and S. Akkaraiu. "Teaching Evolution: From SMART Objectives to Threshold Experience." *The Journal of Effective Teaching*, 14.2 (2014): 35-48. Web.

##### Business

Hawkins, B., and G. Edwards. "Managing the Monsters of Doubt: Liminality, Threshold Concepts and Leadership Learning." *Management Learning* 46.1 (2013): 24-43. Web.

Hibbert, Paul, and Ann Cunliffe. "Responsible Management: Engaging Moral Reflexive Practice Through Threshold Concepts." *Journal of Business Ethics* 127.1 (2013): 177-88. Web.

Nichols, E., and A. L. Wright. "Using the Everest Team Simulation to Teach Threshold Concepts." *Journal of Management Education* 39.4 (2015): 531-37. Web.

##### Computer Science

Alston, P., Walsh, D. and G. Westhead. "Uncovering 'Threshold Concepts' in Web Development: An Instructor Perspective." *ACM Transactions on Computing Education*, 15.1 (2015): 1-18. Web.

Falkner, N. J. G., R. J. Vivian, and K. E. Falkner. "Computer Science Education: The First Threshold Concept." *Learning and Teaching in Computing and Engineering* (2013): 39-46. Web.

Miller, Craig S., Amber Settle, and John Lalor. "Learning Object-Oriented Programming in Python." *Proceedings of the 16th Annual Conference on Information Technology Education - SIGITE '15* (2015): 1-12. Web.

Zwaneveld, B., Perrenet, J., and R. Bloo. "Discussion of Methods for Threshold Research and an Application in Computer Science." *Threshold Concepts in Practice*. Eds. Ray Land, Jan Meyer, and M. Flanagan. Rotterdam: Sense Publishers (2016): 269-284. Print.

#### Economics

Davies, Peter and Jean Mangan. "Assessing Progression of Students' Economic Understanding: The Role of Threshold Concepts." *Threshold Concepts and Transformational Learning*. Eds. Ray Land, Jan Meyer and Caroline Baillie. Rotterdam: Sense Publishers, 2010. 193-206. Print.

Davies, Peter and Jean Mangan. "Threshold Concepts and Integration of Understanding in Economics." *Studies in Higher Education*, 32.6 (2007): 711-726. Web.

Davies, Peter and Jean Mangan. *Threshold Concepts in Economics: Implications for Teaching, Learning, and Assessment*. Staffordshire: Staffordshire University, 2013. Web.

O'Donnell, Rod. "Threshold Concepts and Their Relevance to Economics." *ATEC: 14th Annual Australasian Teaching Economics Conference*. (2009): 190-200. Web.

Pang, M. and Jan Meyer. "Modes of Variation in Pupil's Apprehension of a Threshold Concept in Economics." *Threshold Concepts and Transformational Learning*. Eds. Ray Land, Jan Meyer, and Caroline Baillie. Rotterdam: *Sense Publishers*, 2010. 365-381. Print.

#### Educational Development & Scholarship of Teaching and Learning

Boyd, Diane E. "The Growth Mindset Approach: A Threshold Concept in Course Redesign." *Journal for Centers on Teaching and Learning*. 6 (2014): 29-44.

Elon University Center for Engaged Learning. "Decoding the Disciplines and Threshold Concepts." Online video interview. *Youtube*. 18 Sept. 2013. [https://youtu.be/Wqe\\_kkFoOq4](https://youtu.be/Wqe_kkFoOq4)

Webb, Andrea Suzanne. *Threshold Concepts in the Scholarship of Teaching and Learning: A Phenomenological Study of Educational Leaders in a Canadian Research-Intensive University Context*. Diss. University of British Columbia, 2015. Web.

#### Engineering

Davey, K. "Results from a Study with Threshold Concepts in Two Chemical Engineering Undergraduate Courses." *Education for Chemical Engineers*, 7.3 (2012): 139-152. Web.

Male, Sally. "Engineering Is Gendered' Is a Threshold Concept." *Women in STEM Careers: International Perspectives on Increasing Workforce Participation, Advancement and Leadership*. Ed. Diana Billmorla and Linley Lord. Cheltenham: Edward Elgar, 2014. 225-46. Print.

Stamboulis, A., Jaffir, Z., and C. Baillie. "Uncovering Threshold Values in First Year Engineering Courses and Implications for Curriculum Design." *Education for Chemical Engineers*, 2012. 1-12. Web.

#### Health Care

Land, Ray, and Jan Meyer. "The Scalpel and the 'Mask': Threshold Concepts and Surgical Education." *Surgical Education: Theorising an Emerging Domain*. Vol 2. Fry, H. and R. Kneebone, eds. (2011): 91-106. Web.

Peacock, S., Murray, S., Scott, A., and J. Kelly. "The Transformative Role of ePortfolios: Feedback in Healthcare Learning," *International Journal of ePortfolio*, 1.1 (2011): 33-48. Web.

van Schalkwyk, S., Murdoch-Eaton, D., Tekian, A., van der Vleuten, C., and F. Cilliers. "The Supervisor's Toolkit: A Framework for Doctoral Supervision in Health Professions Education: AMEE Guide No. 104." *Medical Teacher* (2016): 1-14. Web.

Wearn, A., O'Callaghan, A. and M. Barrow. "Becoming a Different Doctor: Identifying Threshold Concepts: When Doctors in Training Spend Six Months with a Hospital Palliative Care Team." *Threshold Concepts in Practice*. Eds. Ray Land, Jan Meyer, and M. Flannagan. Rotterdam: Sense Publishers (2016): 223-238, Print.

#### Information Literacy

Moraine Valley Community College Library. "What's the Big Idea? Incorporating Threshold Concepts into Your Teaching Practice." Online lecture. *Youtube*. 15 Apr. 2015. <https://youtu.be/OSahSjLBF-w>

SJSU School of Information. "The Expert Searcher and Threshold Concepts." Online screencast. *Youtube*. 9 Dec. 2013. <https://youtu.be/4I1Ue0vpcMw>

#### Law

Davies, S. "From Law to 'Legal Consciousness': A Socio-Legal Pedagogical Expedition." *Law in Context*, 29.2 (2013): 42-58. Web.

Wimshurst, Kerry. "Applying Threshold Concepts Theory to an Unsettled Field: An Exploratory Study in Criminal Justice Education." *Studies in Higher Education* 36.3 (2011): 301-14. Web.

Weresh, Melissa. "Stargate: Malleability as a Threshold Concept in Legal Education." *Journal of Legal Education*, 63.4 (2014): 689-728. Web.

#### Learning in Higher Education

Gourlay, Lesley. "Threshold Practices: Becoming a Student through Academic Literacies." *London Review of Education* 7.2 (2009): 181-92. Web.

Kiley, Margaret. "Identifying Threshold Concepts and Proposing Strategies to Support Doctoral Candidates." *Innovations in Education and Teaching International*. 46.3 (2009): 293-304. Web.

Humphrey, Robin and Bob Simpson. "Writes of Passage: Writing up Qualitative Data As a Threshold Concept in Doctoral Research." *Teaching in Higher Education*, 17.6 (2012): 735-746. Web.

#### Literature

Johnson, Allan. "Thresholds of Interpretation: Identifying, Producing, and Supporting with The Turn of the Screw." *CEA Critic* 77.2 (2015): 196-210. Web.

Orsini-Jones, M. "Troublesome Language Knowledge: Identifying Threshold Concepts in Grammar Learning." *Threshold Concepts within the Disciplines*. Land, R., Meyer, J., and J. Smith, eds. Rotterdam: Sense Publishers, (2008): 213-226. Print.

Wisker, G. "Crossing Liminal Spaces: Teaching the Postcolonial Gothic." *Pedagogy: Critical Approaches to Teaching Literature, Language, Composition, and Culture* 7.3 (2007): 401-25. Web.

#### Social Work

Adorno, Gail, Courtney Cronley, and Kenneth Scott Smith. "A Different Kind of Animal: Liminal Experiences of Social Work Doctoral Students." *Innovations in Education and Teaching International* 52.6 (2013): 632-41. Web.

Carlisle, Patricia. "Religion and Spirituality as Troublesome Knowledge: The Views and Experiences of Mental Health Social Workers in Northern Ireland." *British Journal of Social Work* (2015): 1-16. Web.

Foote, Wendy. "Threshold Theory and Social Work Education." *Social Work Education* 32.4 (2013): 424-38. Web.

Marsh, I. and J. White. "Boundaries, Thresholds and the Liminal in Youth Suicide Prevention and Practice." *Youth Work, Early Education, and Psychology: Liminal Encounters*. Eds. Skott-Myhre, Hans,

Pacini-Ketchabaw, Veronica, and Kathleen Skott-Myhre. New York: Palgrave Macmillian, 2016. 69-89. Print.

#### Women's Studies

Hassel, Holly, Reddinger, Amy, and Jessica van Slooten. "Surfacing the Structures of Patriarchy: Teaching and Learning Threshold Concepts in Women's Studies." *International Journal for the Scholarship of Teaching and Learning* 5.2 (2011): 1-19. Web.

Launius, Christie, and Holly Hassel. *Threshold Concepts in Women's and Gender Studies: Ways of Seeing, Thinking, and Knowing*. New York: Routledge, 2015. Print.

Male, Sally. "Engineering Is Gendered' Is a Threshold Concept." *Women in STEM Careers: International Perspectives on Increasing Workforce Participation, Advancement and Leadership*. Ed. Diana Billmoria and Linley Lord. Cheltenham: Edward Elgar, 2014. 225-46. Print.