Transdisciplinary Threshold Concepts in Techno-Anthropology

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Abstract

This paper reflects on a slow re-reading of Maggi Savin-Baden's *"Impact of Transdisciplinary Threshold Concepts on Student Engagement in Problem-Based Learning"* and its relation to the author's experiences as a teacher and curriculum developer in Techno-Anthropology at Aalborg University. It explores four transdisciplinary threshold concepts—liminality, scaffolding, pedagogical content knowledge, and pedagogical stance—as critical to enhancing student engagement in transdisciplinary problem-based learning (PBL). These concepts facilitate transformative learning, helping students navigate disciplinary boundaries and reform their professional and academic identities. The paper critiques traditional scaffolding practices, advocates for balanced guidance, and emphasizes the role of reflective pedagogical stances in fostering trust and deep engagement. It underscores the value of transdisciplinary approaches to addressing complex real-world challenges through PBL.

Keywords: Maggi Savin-Baden; Problem-based learning; Interdisciplinary PBL; Transdisciplinary PBL; Liminality; Scaffolding; Pedagogical content knowledge; Pedagogical stance; Slow reading.

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Introduction

In this paper, I will present and reflect on Maggi Savin-Baden's paper "Impact of Transdisciplinary Threshold Concepts on Student Engagement in Problem-Based Learning". It was published in 2016 in the "Interdisciplinary Journal of Problem-Based Learning" as a review paper on student engagement in Problem-Based Learning (PBL).

I first encountered the paper in early 2017 when two good colleagues, (Lone Stub Petersen and Petko Karadechev), and I were engaged in a curriculum development project with the aim of improving the integration between students enrolled in the master's program of Techno-Anthropology at Aalborg University. As many other master's programs with a heterogeneous student population, it faced (and faces) difficulties integrating students with different disciplinary backgrounds. Students found it challenging to collaborate with peers with other backgrounds than themselves. As a result, different disciplinary perspectives were not utilized in project work. We did a literature review that revealed that not much was written about inter- and transdisciplinarity in PBL. The most central hit was Baden's article, and we later used the transdisciplinary threshold concepts as the theoretical underpinning when we analyzed empirical material collected during the curriculum development project. It was a coincidence that Maggi Savin-Baden visited Aalborg University in May 2017 when we had just started the development project. Here she presented her work on transdisciplinary threshold concepts in her keynote lecture (Savin-Baden, 2017) during AAU's annual Day of Learning.

In 2021 we managed to publish our conclusions in the book (Karadechev et al., 2021). Thus, my colleagues and I worked quite intensively with Maggi Savin Baden's paper over a period of four years. Since then, we have asked our master's students in Techno-Anthropology to read her paper as part of the first introduction week of the study-program.

When I decided to contribute to this special issue, it was not difficult for me to select the PBL research paper that had been most influential to me. Thus, I engaged with a slow re-reading of Baden's Transdisciplinary Threshold Concept paper in the fall of 2024.

Slow reading

Slow reading is a deliberate and intentional approach to reading where a reader takes their time to carefully absorb and engage with the text. Unlike speed reading, which focuses on reading quickly to maximize information intake,

slow reading emphasizes depth, comprehension, and reflection. This type of reading is often used to enhance understanding, foster deep thinking, and appreciate the nuances of language, structure, and meaning in a text (Miedema, 2009).

The methodology of my slow re-reading was split into four steps. The first step regards choosing a text that is worthy of a slow read. As an experienced reviewer of manuscripts submitted to the "European Journal for Engineering Education" and the journal of "Science and Engineering Ethics", I know that many academics in their paper introductions quickly mention many references and write no more than one line to describe each reference's content. Most likely they have not read slowly the papers they reference. Slow reading requires reflection to pick a text that one wants to slow read, as time constraints the number of texts that can be read slowly. Above I have presented the context and some reflections on why I chose to slowly read Maggi Savin-Baden's text.

The second step in the applied slow reading methodology deals with the actual reading. Here I thoroughly read in periods of 45 to 60 minutes. I read on an A4 sized digital tablet using the PDF editor LiquidText which enables me to use my digital pen to highlight text passages that I find important, interesting, or difficult to understand. I can also write notes in the margin of the text when thoughts, ideas, and associations pop up in my head when I read.

Reflection is the next step in slow reading. After I read a 45 to 60 minutes part of the text I self-reflected about what I read. With self-reflection I mean that I had an inner dialogue with myself on the meaning of the read text, how and why the text was important for my own work, and if I would have written something differently. This reflection step could easily have been done as a collective process—as a dialogue with peers who also had read the same text.
The final step consists of extracting the outcome of my reflections and connecting its bits and pieces into one argument. This step resemblances book reviews that are (still) published in some journals. Here, I want to highlight the journal "Metascience" edited by Brad Wray and Jonathan Simon as it in each number issues around 30 book reviews from the fields: History and Philosophy of Science and Science and Technology Studies. When I do book reviews I link my reading to my own work. In this essay, I will do the same and link the slowly read text to my own work with Techno-Anthropology.

Threshold concepts

Savin-Baden explores transdisciplinary threshold concepts and their potential benefits in problem-based learning at the tertiary level. To understand these

concepts, the Savin-Baden text first considers Meyer and Land's 2006 definition of a threshold concept, which they describe as a pivotal learning point—a "portal" that offers students a new way of understanding something essential. A threshold concept represents a fundamental shift in comprehension, a "transformed way" of seeing that allows learners to make progress in their academic journey (p. 3).

A threshold concept is disruptive because it doesn't fit neatly within existing knowledge structures; instead, it pushes beyond the limitations of current understanding and opens new possibilities. This "transformed way" involves asking deeper questions such as why we understand knowledge in certain ways, how our current understanding is structured, and what other potential forms of knowledge exist to complement our existing knowledge. Without these disruptive, threshold-induced inquiries, meaningful academic progress would be very difficult.

Savin-Baden emphasizes that threshold concepts play a key role in allowing students to engage with Transformative Learning (Mezirow, 1997; Illeris, 2014) and to form deeper and transcending connections with their disciplines, thereby facilitating new insights and academic advancement. Threshold concepts have five key characteristics. They are:

- Transformative: Changing how students perceive their discipline.
- Troublesome: Presenting ideas that seem counterintuitive or alien at first.
- Irreversible: Once understood, these concepts are hard to unlearn.
- Integrative: Helping students bring together previously disconnected ideas.
- Bounded: Limiting themselves to a specific conceptual domain.

However, before arriving at new and transformative insight threshold concepts give rice to perplexion, frustration, and possibly loss of motivation. Thus, threshold concepts also present themselves as barriers that must be overcome before transformative learning can be achieved. Threshold concepts are central for understanding barriers to students' learning and students' lack of motivation for engaging with PBL. They have a dialectical nature: At first, they present barriers to learning that must be overcome. But when the barriers are overcome and tackled a reward awaits: new learning!

Transdisciplinarity

Having presented the threshold concepts, Savin-Baden argues that,

> "while the idea of threshold concepts being located within disciplines is useful to a degree, they need to be broadened. Instead, particularly in the context of PBL, transdisciplinary threshold concepts are more helpful." (p. 3)

Threshold concepts are not only localized within disciplines. Transdisciplinary threshold concepts share above mentioned traits, but differ in scope, as they apply across multiple disciplines. Thus, transdisciplinary threshold concepts foster a more holistic understanding that transcends disciplinary boundaries. PBL is transdisciplinary in nature. Savin-Baden defines transdisciplinary threshold concepts as transcending…

> "disciplines and subject boundaries, but which are challenging and complex to understand, but once understood, the student experiences a transformed way of understanding, without which they would struggle to progress with the curriculum." (p. 3)

In our book on Techno-Anthropology, we extend this understanding of transdisciplinarity. Here, students enroll in an academic master's program with different bachelor's degrees. Some degrees prepare for academic life in specific disciplines (such as bachelor's degrees in Anthropology or Techno-Anthropology) and some for different professions such as nursing, bio-analytical work, radiography, social work, engineering or medicine. By enrolling bachelors from different professions, some with years of work experience, the master's program in Techno-Anthropology enacts transdisciplinary threshold concepts by staging student transitions between professional and academic practices. At Techno-Anthropology we saw professional bachelors experiencing difficulties in entering academia and academic bachelors experiencing difficulties in engaging with professional real-life problems and practices. Our development project did not (only) address challenges of individual learning and motivation in PBL; it addressed structural problems of translation between academia and other professional worlds.

Transdisciplinarity has been defined in various ways. Some, like Piaget (1974), describe it as a unity of knowledge that transcends disciplines, operating between, across, and beyond them. Others, such as Funtowicz and Ravetz (1993), emphasize its role in addressing uncertain problems by identifying the most relevant problem statements. From a techno-anthropological viewpoint, transdisciplinarity involves continuous awareness of different social worlds involved, blending theoretical understanding with practical application to

tackle real-world societal problems through the interplay of technological, social, and socio-technical perspectives. We experienced that transdisciplinary threshold concepts can also be used to understand and facilitate students' transitions from a professional world to academia.

Based on a literature review on student engagement in PBL Savin-Baden identifies four transdisciplinary threshold concepts that are required to enhance student engagement in PBL and transition between social worlds: 1) liminality, 2) scaffolding, 3) pedagogical content knowledge and 4) pedagogical stance. In the remaining part of the paper, I go through these four concepts one by one and add my reflections on how they relate to Techno-Anthropology.

Liminality

Traditionally, liminality is tied to rituals or rites of passage, marking a transition between states. Turner's ethnographic work (1969) uses liminality to describe a transitional space or time, such as the initiation process boys undergo to become men. In the context of PBL, liminality can be viewed as a threshold concept, representing the oscillation between engagement and disengagement, or being "stuck" between mental states.

Savin-Baden emphasizes that liminality is a transdisciplinary threshold concept within student engagement in PBL because it represents a complex and often confusing learning space. Students (and sometimes supervisors) may not recognize that navigating this liminal space can foster deeper learning and emotional involvement with the material. Unlike traditional educational methods, which aim to impose order and structure, liminality embraces the fluidity and uncertainty of personal development, offering a more holistic approach to student engagement. This oscillating process challenges conventional strategies by encouraging a deeper connection to learning and personal growth.

> "[Liminality] tends to be characterized by a stripping away of old identities and an oscillation between states; it is a betwixt and between state, and there is a sense of being in a period of transition, and an oscillation between states and personal transformation." (p. 7)

I recognize liminality from my interaction with and supervision of Techno-Anthropology students. Those who enter the master's program with a professional bachelor's degree understand they are about to embark on a transformative journey that will bring them towards radical new learnings. Some want to through away their old disciplinary or professional identity. Others realize that they will gain additional skills and add a new layer to and

reform their old identity. Nether the less, all students with a professional degree recognize this liminal space when they join Techno-Anthropology. They are in a good place for transformational learning. Only some of those who enter the master's program with an academic bachelor's degree in Techno-Anthropology realize that they have entered a liminal space, and that their identity as a techno-anthropologist will change in the meeting real life professional problems. Those who do not recognize the master's program as a liminal space miss an opportunity for transformative learning, and only develop more of what they already have.

Scaffolding

Scaffolding involves a gap between a student's ability to solve problems independently and their ability to solve them with guidance. This concept highlights scenarios where students may experience a consequential increase in stuckness. Such stuckness occurs either when students struggle to grasp a supervisor's "map for learning" or when there is a mismatch between the students' and supervisors' approaches. Interestingly, as Savin-Baden notes, "in more cases than we would wish to acknowledge, the student's map is better than that of the [supervisor]" (p. 12), emphasizing how students sometimes possess valuable perspectives that differ from the supervisor's perspective. A central message is that…

> "it would seem that [supervisors'] need to scaffold learning is troublesome and results in student disenchantment. […] Thus, removing or minimizing scaffolding can enable [supervisors] to improve student engagement in PBL." (p. 11)

Student engagement is closely tied to crossing educational and academic thresholds through a balanced approach that recognizes and reinterprets scaffolding concepts. This approach acknowledges the role of scaffolding while intentionally moving beyond it.

Scaffolding, when viewed positively, serves as a starting point for engagement, but it must be reconsidered, deconstructed when necessary, and recontextualized rather than being treated as a fixed method to be followed without question. Effective scaffolding involves operating in a space where individual and assisted learning intersect, allowing diverse approaches to connect and interact. This makes scaffolding a transdisciplinary threshold concept—positioned at the intersection of guided support and autonomous problem-solving, where distinct perspectives converge, exchange, and evolve. When I supervise and otherwise interact with Techno-Anthropology students, they often ask for scaffolds, including project reports from last year and

illustrative problem-solving examples. I only provide these scaffolds in the initial phase of the project work, allowing the students to transcend the scaffolds and develop their own research design. Thus, reimagining scaffolding as a transdisciplinary threshold concept provides fresh insights into supervision practices that enhance student engagement. I do introduce scaffolds, but they are always accompanied by a call for transgression.

Pedagogical Content Knowledge

Pedagogical content knowledge involves understanding factors that make specific topics easier or more challenging to learn. Bringing together students from diverse academic and practical backgrounds to work productively with a single problem is complex, and the success of such efforts often hinges on understanding pedagogical content knowledge as a transdisciplinary threshold concept.

This concept, as the term implies, centers around the practices and methods that reshape familiar knowledge into new, interdisciplinary frameworks. By drawing on students' internalized background knowledge, pedagogical content knowledge connects past and future learning, leveraging the benefits of previously acquired knowledge. Its transdisciplinary nature arises from its ties to prior understanding, which is activated and reshaped through engagement with fresh contexts, situations, and knowledge.

Pedagogical content knowledge is about re-contextualizing specific types of information—disciplinary content—through the lens of pedagogy, making it accessible and relevant across disciplines.

> "Students may have, for example, studied psychology in high school, but the use and portrayal of psychology in a medical or theology degree is reformulated to reflect the pedagogical content knowledge. The result is that knowledge for a particular discipline is taught and fashioned within it and for it, and thus it is for many students a threshold concept." (p. 14)

Translating existing content knowledge into a new academic context requires open questions from one discipline engaging with another, fostering conceptual thinking that considers new perspectives.

No single discipline alone can fully accommodate real life problems, making pedagogical content knowledge a transdisciplinary threshold concept that enhances student engagement in PBL when expanded beyond traditional disciplinary boundaries.

One of the strengths of Techno-Anthropology is that it draws on knowledge, tools and resources from different disciplines in students' project work. Not only are different resources brought into the program through translation of the knowledge, skills and competences beheld by the heterogenic student population. The study program's curriculum also brings in tools from different disciplines such as technology studies, philosophy of technology, and technology ethics along with technology specific domain knowledge and methods. Neither supervisors nor students fully master all the different lenses evoked and enacted in project work. PBL continues to be iterative and work in progress.

Pedagogical stance

Pedagogical stance reflects how students perceive themselves as learners within specific educational settings. This stance is shaped by the choices they make in learning situations and by the unique learning histories they bring to each environment.

Savin-Baden stresses:

> "These types of pedagogical stance can be seen as transdisciplinary threshold concepts, in that they are stages through which students pass on the way to high-level deep engagement in learning. Thus they journey across multiple thresholds on their way toward reflective pedagogy." (p. 16)

The pedagogical stance involves not only the student's relationship with their educational environment but also the intentional actions of the supervisors. Central to this stance in PBL is trust. Savin-Baden highlights two essential types of trust: (1) the personal trust students need to develop as they apply new knowledge, skills, and competencies, and (2) the trust that supervisors should place in students who require guidance, enabling them to experiment, make mistakes, and explore creatively. While both types of trust are indeed personal, relating to individuals' sense of security, the broader issue at hand is about control within the learning process.

During the first month of all master's programs at Aalborg University students are offered sessions on the PBL model where they are encouraged to reflect on and explicitly formulate the learning strategies, they bring with them into the program. This makes it possible for them to realize that students approach learning differently, and it encourages students to develop new learning strategies.

Conclusion

In this paper, I present the outcomes of a slow reading of Maggi Savin-Baden's "Impact of Transdisciplinary Threshold Concepts on Student Engagement in Problem-Based Learning". Four transdisciplinary threshold concepts are introduced—liminality, scaffolding, pedagogical content knowledge, and pedagogical stance—and applied to my experiences as a supervisor and curriculum developer at the master's program in Techno-Anthropology. When students enroll in this program most of them find themselves in a liminal space with good possibilities for transformative learning if they manage to transgress presented scaffolds, reconceptualize background knowledge, and reform their learning styles.

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