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Threshold Concepts, LEGO® SERIOUS PLAY® and whole systems thinking: towards a combined methodology

Graham Barton*
Academic Support
University of the Arts London
g.p.barton@arts.ac.uk

Alison James
Academic Quality and Development
University of Winchester
alison.james@winchester.ac.uk

Abstract

This paper sets out a methodology for enhancing student and curriculum engagement with Threshold Concepts (Meyer and Land 2003; 2006) and associated notions of liminality (Land, R., Rattray, J., Vivian, P., 2014) across a range of disciplinary fields. The methodology builds closely on application techniques developed in LEGO® SERIOUS PLAY®, the evolution of which is informed by systemic views of, for example, organizational and strategic leadership, and systems theories such as Complex Adaptive Systems (Oliver and Roos, 2000). In recent years, we, and others, have adapted this methodology for use in educational settings, particularly as a vehicle for metaphorical exploration of dimensions of learning associated with professional and personal development (James, 2013; Gauntlett, 2011). Illustrating such approaches through exploratory practice undertaken with students at the University of the Arts London, we describe how they can be used to explore further dimensions of student learning: the models built in LEGO® offer mediating artefacts (Vygotsky, 1930/1978; Engeström, 1999) for mapping the epistemological terrain of a discipline, for supporting student learning of threshold concepts, and in particular for creating representative constructions to help learners negotiate liminality. The paper continues with a conceptual analysis of these experiences; through evaluating the methodology and

* Corresponding Author

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theoretical context described, the paper suggests an emerging rationale for locating the Threshold Concepts Framework within a whole systems view of disciplinarity, and for using LEGO®-based activities to engage learners and practitioners with this view in potentially generative ways.

Keywords: Threshold concepts, mediating artefacts, LEGO® SERIOUS PLAY®, 3-D, whole systems thinking, stuckness, liminality

Introduction

This paper has its origins in a range of pedagogical enquiries undertaken individually by the authors over a two-year period, leading to a collaboration conjoining LEGO® SERIOUS PLAY® with Threshold Concepts Theory in 2014. These diverse strands have resulted in our suggestion of a new perspective on ways of engaging with, and developing, student grasp of Threshold Concepts (Meyer & Land 2003; 2006), and the potential for further development of the Threshold Concepts Framework (TCF). This involves using techniques rooted in LEGO® SERIOUS PLAY® as exploratory tools for supporting student learning of threshold concepts, in particular in creating symbolic constructions to help negotiate liminality, and as mediating artefacts (Vygotsky, 1930/1978; Engeström, 1999) for mapping the epistemological terrain of a discipline. Having trialled the methodology and situated it within the broader context of design thinking and systems thinking, we suggest that this combination is particularly effective for negotiating and understanding troublesome knowledge and associated liminality.

Land, Rattray and Vivian note how engagement with troublesome knowledge involves "attempts to derive meaning from symbolic representation, linguistic, mathematical or graphical" (2014, 203), but make no mention of deriving meaning from physical or embodied symbols, such as models and landscapes. We propose that making metaphorical constructions – using LEGO® or other materials – can add a significant additional dimension to these enquiries. This potential has hitherto been overlooked in the literature associated with liminality/threshold concepts. In this paper we explore how three dimensional and multisensory approaches can be adopted as new, embodied formats in order to impact positively on learning, to enhance the application of the

Threshold Concepts Framework to the disciplines, and to generate insights into the nature of the framework itself.

Background

Our territory for testing this out has been varied: designing and delivering a new Academic Support programme at the University of the Arts London from February to June 2014, as well as conference and staff development workshops and a range of initiatives using LEGO® SERIOUS PLAY® in educational contexts. In this paper we touch on the different research perspectives that underpin our collaborations, sketch our rationale for, and educational adoption of this methodology, and summarise and consider emerging findings from our pilot programme and parallel activities. We situate all of these within the broader theoretical landscape within which we are operating - that of systems and design thinking and its relationship to the TCF. We have assumed that the TCF is broadly understood by the reader, so we have chosen to leave out a description of its fundamentals but provide an introduction to LEGO® SERIOUS PLAY® below. We would like to emphasise that our paper speaks to recent trends in the literature on engaging students with Threshold Concepts - hereafter TCs - and the development of the literature on the need for further enquiry into liminality (and related affective dimensions), and into inter- and trans-disciplinarity. In our discussions of systems thinking, we recognize that systems thinking has numerous variants; we are locating our thinking within Sterling's whole systems thinking perspective, a holistic approach to systems thinking contextualised later in this chapter (Sterling, 2003, drawing on Bateson, 1972).

LEGO® SERIOUS PLAY® and metaphorical exploration

LEGO® SERIOUS PLAY® has been used globally, primarily as a business development tool but increasingly for personal, curriculum and educational development. Through building with LEGO bricks, it offers a systematic and three-dimensional process for deepening understanding of issues, building connections and relationships and uncovering insights and thinking laterally and creatively about phenomena. It is a fluid and generative process, the outcomes of which are not predetermined, and which enable learning to take place in more agile ways. The outcome is twofold: the

production of a three dimensional construction in LEGO and the narration of what it represents, including its affective dimensions, and the position/knowledge students have reached as a result of building it. For greater detail on LEGO® SERIOUS PLAY®, we point readers to Kristiansen and Rasmussen (2014), Nolan (2010), Gauntlett (2011), and James and Brookfield (2014). We wish to make clear that our application of techniques strays from those strictly specified in accredited facilitator training and therefore the reader should assume that our references to LEGO® SERIOUS PLAY® indicate a 'non-purist' interpretation of the methods. However, its principles and application techniques are present and influence our emerging methodology.

Theoretical foundations underpinning LEGO® SERIOUS PLAY®

It is our belief that LEGO® SERIOUS PLAY® integrates multiple theoretical positions, which for the sake of space we will not discuss in full here. These include Varela and Rosch's embodied mind (1991); Csikszentmihalyi's psychology of optimal experience (1990); Arnheim's visual thinking (1972); and Mezirow's transformative dimensions of adult learning, 1991). Perhaps the most important contribution though, is made by Papert's constructionist theory that everything can "be understood by being constructed" (Papert, 1999, Papert & Harel 1991), and his argument that when students learn by constructing something, two kinds of learning happen: one, when making an object, new knowledge and theories are also created in the mind of the maker, and two, knowledge embodied in the first object encourages increasing complexity in the next object created by that maker. LEGO® SERIOUS PLAY® training manuals emphasise 'hand knowledge' as central to building, or how, given communication between nerve endings in the fingers and nerve cells in the brain, the activity of the hands stimulates thought. Workshop participants 'think with their fingers' by scrabbling through bricks and follow the instincts and ideas this generates in order to build metaphorical constructions of experiences, including abstract and intangible elements, share, discuss and reflect on these in a democratic and non-hierarchical way, and construct new knowledge and awareness as a result. Metaphor has been much discussed in pedagogic literature since Lakoff and Johnson's (1980) recognition of it as a recurring component of human communication, rather than language confined to the literary or arcane. The link between metaphorical construction and TCs is clear given the notion of thresholds as portals or gateways to an altered way of understanding and perceiving, and what Land, Rattray and Vivian (2014) term 'the spatial metaphor of liminality'.

Figure 1. Example construction of liminality in LEGO® (University of the Arts London, 2014)

Experience of liminality: uncertain outcomes
"[This is me] stepping into a world of uncertainty."

LEGO® and liminality

The building of models allies itself powerfully with the exploration of liminal space in which past and present knowledge of something is reviewed, new elements integrated and a revised version of that knowledge or understanding emerges. Just as the liminal space is fluid, so too can be the building process, not least because it allows for the imaginative evocation of space around the material (in this case LEGO bricks) as an invisible part of that model. An interpretivist approach is adopted and nothing need be static: LEGO pieces can be configured, reconfigured, and changed through the creation of the model, or added to after discussion. In the same way that understanding may be gradually developed (as often illustrated by the SOLO taxonomy (Biggs & Collis, 1982) so an organic and iterative process of building, discussing and reflecting allows for the gradual integration and emergence of a new way of knowing.

Furthermore, LEGO® SERIOUS PLAY® explorations allow for 'what if?' construction and scenario-testing that offer safe excursions into liminality – somewhere where different options can be created, questioned, tested and reconfigured until the individual builder and/or group are satisfied with the outcome, or at the very least satisfied with the

process. The LEGO® SERIOUS PLAY® 'effect' can be said to map neatly onto Land, Meyer and Baillie's view of the relational features of TCs (2010:13) in that the pre-liminal stage features the apprehension and questioning exhibited when faced with a topic (in some of our workshops, managing 'stuckness' in learning), while the liminal and post-liminal stages can actually be said to blur slightly or cross over categories. These liminal characteristics can be said to align with LEGO® SERIOUS PLAY® experiences; however, the very act of building and the insights this unleashes means that crossing conceptual boundaries is not solely confined to the post-liminal stage. Indeed, recent explorations in the TC literature (summarised in Land et al, 2014; Allen et al, 2014) point to the need for students to develop a resilient disposition, or perhaps an *antifragile* (Taleb, 2012) disposition towards the experience of liminality.

LEGO® SERIOUS PLAY® and identity

Notions of liminality within the TCF are connected intrinsically to the insights from transformative learning and identity work (Illeris, 2007; 2014; Bauman, 2000; Turner, Savin-Baden, 2008) and similarly, identity is a backbone of LEGO® SERIOUS PLAY® applications (Gauntlett, 2007, Nolan, 2010, James, 2013, James & Brookfield, 2014). From the perspective of identity and these research activities, there seemed to be the potential for numerous benefits from using LEGO® SERIOUS PLAY® which we wished to test out in relation to TCs: one of these was the finding, long accepted within the LEGO® SERIOUS PLAY® community, that building something three-dimensionally made it more memorable than merely talking or writing about it. In addition to creating a physical object which implants itself in the memory, through its visual nature as well as other associated qualities such as humour, or a deeper kind of shared meaning, scale, colour, depth and texture can all be used to embody feelings and understandings of a concept or practice, with the object becoming a mediating artefact to discuss and clarify perceptions of a subject, issue, relationship or experience. The scope for identity work alluded to above unifies these possibilities in the same way that transformative learning experiences described by Mezirow (1991) and Illeris (2014) relate to learning in general and how TCs also impact on self-conception and identity (Meyer and Land 2005).

Methodology

Using LEGO® SERIOUS PLAY® to explore Threshold Concepts and liminality

Our decision to triangulate the three domains of LEGO® SERIOUS PLAY®, threshold concepts and whole systems thinking was informed by a number of prior investigations, theoretical and empirical. As already indicated, we recognized resonances in the TCF/liminality and LEGO® SERIOUS PLAY® literature and in our shared educational experiences, and in the whole systems thinking perspectives that arguably underpin both of the above approaches, discussed later in this article.

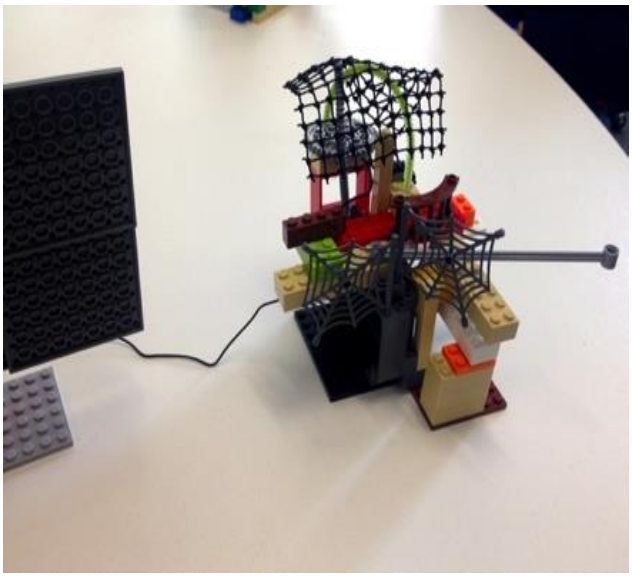
Some significant groundwork had been developed in the TC literature to identify TCs that might be important for the students in an arts-based university, such as *signification, semiotics* (e.g. Land, 2003; 2012); *toleration of uncertainty / uncertain outcomes* (e.g. Osmond, 2009); the role of *unknowing* and *unlearning* in creativity (e.g. Allen, 2014); *subjective interpretation* (McKim & Moffatt, 2013); and *recognising habituated responses* (Meyer, 2013). These examples provide points of focus for a form of deliberative practice to identify discrete phenomena within an episteme, the latter defined by Perkins as a system of ideas or way of understanding that allows us to establish knowledge (2006). In other words, the above TCs identified in the literature invite “analytic discussion and deliberative practice” to “surface the game” (Perkins, 2006, p 43). In our explorations, the episteme constitutes the set of thresholds associated with the practices, conceptions and perceptions of a student’s discipline or subject area, and our deliberative practice is using LEGO® SERIOUS PLAY® to enable students to explore liminal space, threshold practices and ways of thinking or practising when encountering such epistemes.

Synthesising our experiences, we endeavoured to surface the game for students by conducting a small-scale pedagogic enquiry to test out approaches to engaging students with TCs. The context for this intervention was a series of workshops on ‘Managing stuckness skilfully’ as part of an Academic Support programme, using LEGO® SERIOUS PLAY®. In particular we wanted to find out which concepts students identified as troublesome or hard to grasp, how they grappled with the difficulties inherent in mastering these, and whether or not such concepts flagged up either

disciplinary distinctiveness or commonality across subjects. We had chosen 'stuckness' following a trial workshop exploring 'postgraduateness' with newly enrolled MA students and from that we cross-referenced the students' observations with the range of TCs common to creative arts noted above. We ran five pilot workshops with 39 students from foundation degree, undergraduate, postgraduate and doctoral programmes in multi-disciplinary and multi-level groups. Our primary aim was to establish whether LEGO® SERIOUS PLAY® could be a useful means of uncovering stuckness and identifying solutions through self- and co-enquiry in order to foster a more enriching learning experience for students. Our secondary aim was to uncover the extent to which students found the TCF a useful filter for examining and thinking about their own learning.

We adopted a programme outline building on approaches already described in James and Brookfield (2014) and used for personal and professional development workshops: this comprised introductory skills building activities, followed by individual discussions and builds of diverse kinds, such as themselves as learners, the factors that affected their experiences and development, and topics including what difficulty or stuckness felt like and the things which caused them to feel stuck. In a spirit of practical self help and collaboration we also got students to build models for themselves and each other of how they move on when stuck – i.e the strategies and solutions - or how to remain comfortable within a liminal space. We wove into these activities an introduction to TCs and asked students to try to elicit what these might look like in their personal disciplinary experience, while also testing out the extent to which 'thinking with their fingers' was a generative and helpful activity.

Figure 2: Example construction of liminality in LEGO® (University of the Arts London, 2014)



Experience of Liminality: Confusion with open briefs

"This is the completely open brief, the blank slate." [On the left]

"It's a metaphor for something that's complex ... it's something I'm writing about now - design and responsibility, ethics" [On the right]

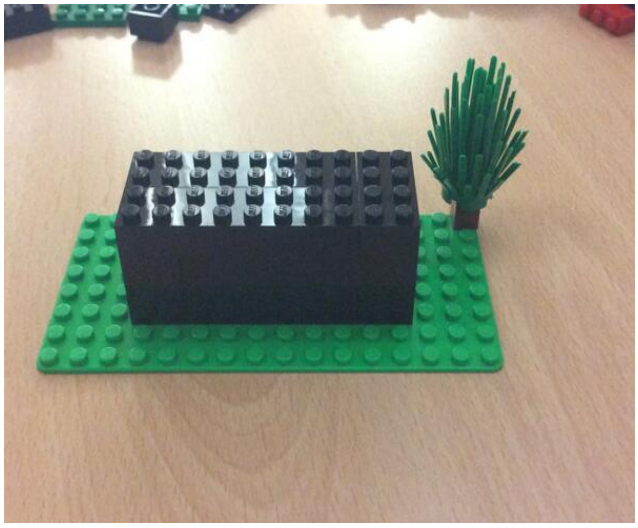
Our experiences

Inevitably our enquiry presented us with challenges. One was we felt torn between wanting to help students find practical techniques for unblocking learning and hoping to test out our hypothesis that LEGO® SERIOUS PLAY® was a valid means of investigating TCs. To resolve this tension we adopted an exploratory practice methodology, defined by Allwright as research in the classroom which incorporates a research perspective, and which therefore fosters understanding (Allwright 2005: 356). Another challenge concerned how to integrate discussion of TCs into the workshops: these workshops were not advertised as being about TCs per se, but rather ones in which we were facilitating the exploration of issues which we fully expected to lead swiftly, directly and naturally to a consideration of TCs – 'by the back door' - which could easily and usefully relate to their own discipline area and activities. One of our ways of addressing this was to inform each workshop with an introduction to TCs at different stages in the workshop, as we tried to find the optimal moment to include them. We also offered participants examples from the literature that had particular resonance for creative disciplines noted above. Part of our difficulty clearly stemmed from the way we had designed our workshops, and also from our reluctance to lead or impose examples of TCs on students. What surprised us was that students confounded our expectations

of what they might say. We had expected that students would naturally identify concrete concepts from within their discipline, aligned with the literature to date (for example, representation, semiotics). However, the result was that students tended to build models of *practices*, dispositions, emotions or liminality and very few or none were of the kinds of conceptual difficulties we had envisaged.

This led us to question whether the act of embodying TCs within LEGO® models was too complex an activity to undertake. However when we invited academic staff (at the Threshold Concepts Conference in Durham, July 2014) to construct models of TCs in their disciplines, all did so with flair and ease. This suggests to us that in our future workshops we need to approach the integration of TCs for those new to the framework in an entirely new way.

Figure 3. Academic staff representation of a Threshold Concept – the liminal black box (Keefer, 2014)



During the workshops, students reflected on how to create a space for unlearning and unknowing during the creative process (Allen, 2014), illustrated through reflective comments noted in the discussions, such as “Keep doing stuff and more stuff will come. The more you do the more you see really.”

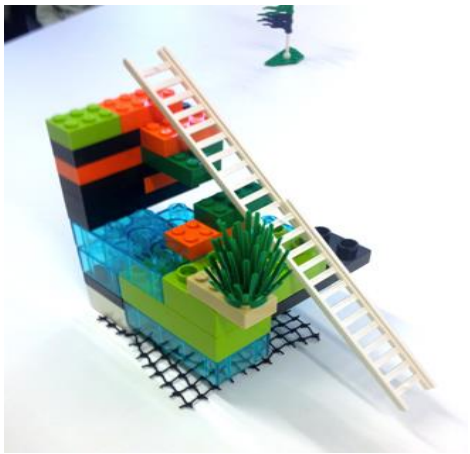
In terms of TCs noted above, students constructed a range of perspectives noted in the literature, some examples of which are set out in figures 4 and 5 below:

Figure 4. Student construction of Threshold Concepts in LEGO® (University of the Arts London, 2014)

Threshold concept: Knowledge is contested (Lea & Street, 2006) | Subjective interpretation and voice (McKim & Moffat, 2013)

[Discussed by the student during the session]
The positioning of the student/tutor relationship, illustrating the value of directing attention of both student and tutor towards considering the project.

Figure 5. Student construction of Threshold Concepts in LEGO® (University of the Arts London, 2014)



Threshold concept: Recognising habituated responses / metacognition / self-awareness (Meyer, 2013; Land, 2014)

"The clear bricks signify vulnerability but strength."
"… build higher ... always flying ... there's all this empty space ... you can jump though…"

Alongside the characteristics and associated descriptions we have attributed to the models outlined above, students seemed oriented towards constructing *threshold practices*, (Gourlay, 2009) and practice-oriented liminality*,* together with certain dispositions and ways of thinking and practising that are common to creative arts. Examples of these from our study extend Gourlay's focus on academic literacy to include affective states or dispositions and practices such as: recognizing the role of mistakes in creative processes, being prepared to unlearn (Allen, 2012/4), and creating dispositions to sit more comfortably with liminality or stuckness, rather than navigating around it or resisting it.

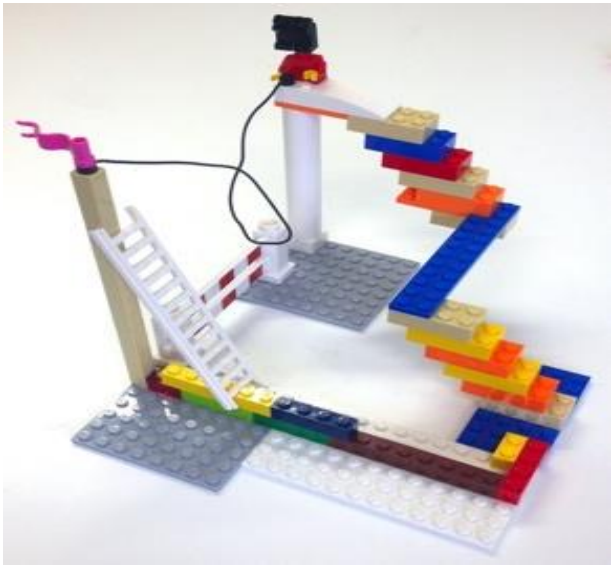
Identifying how to engage with stuckness and consider that it is a natural part of the creative process became clear both for students and us through the process of building representative constructions. The encouragement to develop self-awareness and self-enquiry offered through the LEGO® SERIOUS PLAY® methodology enabled students to surface multiple subjectivities, positioning of practice and identity, and for us demonstrated different student perspectives and constantly shifting conceptions and/or capabilities. This made us consider that, in addition to threshold *practices* (Gourlay, 2009) and threshold *capabilities* (Meyer and Timmermans, 2013), students seemed to be constructing what might be termed *threshold dispositions,* and *threshold perspectives,* and not just threshold *concepts*. These terms are under further investigation by the authors through the developing methodology outlined here.

Further dispositions surfaced in the sessions, with students noting the importance of *making mistakes as a starting point for creativity*, "building things other than what you are trying to do", and *having the confidence to interrupt*. Given these preliminary findings, the approach we have taken may help answer Land's questions as to what "dispositions and affective states may be beneficial in assisting students successfully to negotiate liminal states", whether they "constitute another incorrigible [or whether they are] susceptible to measurement" (2012). The affective states and dispositions embodied by students in these workshops suggest that LEGO® SERIOUS PLAY® allows the identification and articulation of such states. Furthermore, the adapted LEGO® SERIOUS PLAY® methodology may well help students build the *threshold capital* identified by Land (2012), for *self-enquiry* of and in liminal spaces, and surface subliminal variation and the underlying game referred to by Perkins. With this in mind, it is worth noting that the student comments from the session evaluations indicate

increased levels of awareness and self-enquiry as a result of experiencing the LEGO® SERIOUS PLAY® approach applied to this educational context:

> "Great way of thinking through concepts."
> "More aware of why/where creative blocks happen."
> "Helps us to know ourselves better."
> "Gather things that don't normally mesh together."

Figure 6. Example construction of liminality in LEGO® (Anonymous blogger, SUARTS, 2014)



"At the top of the staircase are a pair of legs, that's me, walking up the stairs, but I don't have a body or head, as I am not sure exactly where I am going."
(Anonymous blogger, SUARTS, 2014)

Discussion

In terms of conceptual analysis, there seem to be a number of theoretical associations emerging from the process that resonate with existing TC literature. The visually memorable metaphors built through the LEGO® SERIOUS PLAY® applications might be creating "transitional and transformative learning spaces" (Savin-Baden, 2008, p. 84-6; James, 2015). Similarly, there are echoes with Sibbett and Thompson's proposal that "appropriately facilitated arts-based learning" and symbolic processing might help learners with "reflexive ways of approaching and processing troublesome and nettlesome experience" (2008). The multi-disciplinary setting of our workshops seems

effective for this form of self-enquiry (a space away from the dynamics of the usual course/colleagues/peers) and for understanding insights into differences and commonalities. Discussion between participants during the workshop allows for observation and commentary from others, which is enriching, although the builder owns the meaning in the model and therefore others cannot superimpose their own reading. Through the building process, entire landscapes and contexts can be constructed which show the individual in situ, with all the attendant factors, variables, influences, relationships, gaps and opportunities that may present themselves. In addition, the three-dimensional form of the landscape allows for the depiction of scale, distance, importance and the metaphorical imagining of challenge or threat (sharks, nets, pirates, bricks, for example), with the potential for insights such constructions might provide.

LEGO® SERIOUS PLAY® and systems thinking

The thread of connecting "things that don't normally mesh together" runs through both the LEGO® SERIOUS PLAY® and TC literature. LEGO® SERIOUS PLAY® emerges from a systemic worldview of leadership and organizational behaviour and systems, in which organizations are, and operate within, complex adaptive systems (Oliver & Roos, 2000). The influence of such systems thinking on organizational strategic management is explicit in LEGO® SERIOUS PLAY® literature (Kristiansen & Rasmussen 2014); Oliver & Roos, 2000; Gauntlett, 2011), and the resonances or synergies between LEGO® SERIOUS PLAY® and TCF contexts are striking. We propose that there is a common foundation of systems thinking between the two educational domains, and a similar perspective that has driven the development of LEGO® SERIOUS PLAY® could be employed usefully within the TCF. Indeed, the TCF can arguably be seen as the outcome of such a *systemic* perspective on the nature of a discipline. While this perspective is perhaps tacit in the TC literature to date, signifiers of systemic worldviews were also evidenced at the recent conference on Emergent Learning and Threshold Concepts in 2013 (Groundwater-Smith, 2013). Further, research efforts to identify integrative TCs within the disciplines support the intention within TCF research to continue surfacing the epistemes or systems of ideas (Perkins, 2006) and their interconnections within the disciplines for the benefit of both student learning and educational research.

With the above in mind, our approach suggests an emerging rationale for locating TCs within a systems view of disciplinarity, and for using LEGO® SERIOUS PLAY® as a method for meaningfully engaging learners and practitioners with this view. This proposal rests on the value that lies in the meaning-making potential of constructing a whole systems perspective on the nature and conceptual substance of a discipline, through which a learner or educational developer can further understand the landscape or terrain of that discipline and their place within, space for and relation to it. Aside from the experience with our students noted above, the rationale for this approach lies in much of the empirical evidence from Papert's constructionism noted earlier in this paper, the use of LEGO® SERIOUS PLAY® to construct representations of, for example, corporate strategy, and also in the use of embodied thinking through LEGO® SERIOUS PLAY® to construct metaphorical landscapes as set out above.

When students of all levels describe their experience of working with LEGO® SERIOUS PLAY® they talk about being able to understand the bigger picture, while also drilling into finer details, and understanding connections, causes, effects and patterns between phenomena and people. Reflecting on this emergence from such activities, we suggest that this methodology renders more visible the interconnected, complex nature of a discipline and its contexts. By building and discussing representative constructions, it can surface more abstract influences such as liminality, threshold dispositions and affective states (Land, 2014). Such constructions might help to expose student learners to "processes that help learners engage with and internalise a systems view of the world" (Sandri, 2013) - or in this case, a systems view of the discipline or practice. This in turn helps students develop epistemic and systemic awareness, noted in recent literature as being beneficial for student learning and development, and, for example, more orientations towards participatory, sustainable and holistic dispositions required for sustainability (Sterling, 2003; Warburton, 2003; Stibbe, 2010-11; Claxton, 2013).

Figure 7. Students making connections to each other's representations of liminality. (University of the Arts London, 2014

Work to engage students with identifying or representing patterns of integration has been reported on in the TC literature, in particular the concept mapping approaches undertaken by Kinchin (2008). Systemic approaches of this nature are used in many other fields, with different systems thinking and systems theory perspectives offering theoretical support for a number of ways in which particular epistemes might be modeled; for example, soft systems methodology (Checkland, 2006), computerized (Forrester, 1961), metaphorical and narrative-led systems thinking (Oliver & Roos, 2000), and more recent approaches informed by Latour's Actor-Network Theory (2005), and by whole systems thinking of the type explicated/developed by Stephen Sterling (2003, drawing on Bateson, 1972). This latter form of systems thinking underpins our research focus on whether visual constructions of the disciplines, and in particular their nodes, wholes and connecting relationships can offer up those disciplines to further analysis, and therefore foster generative, appreciative and/or critical enquiry into their respective nature. By visualizing the disciplines and the place of TCs within a metaphorical landscape, and including affective states and dispositions associated with liminality, LEGO® SERIOUS PLAY® gives a direct, experiential way of perceiving or deepening understanding of the dimensions of such nodes, connections and related abstract conceptions within a system. In doing so, we argue that it is possible to build on

this type of metaphorical enquiry in order to design a set of learning conditions that cultivate useful views of the epistemes for the learner.

With systemic shifts in HE introducing rapid change to the nature of disciplines - such as research-based learning, assessed interdisciplinary collaborations, increasing curricula emphasis on co-creation, and students as co-producers of knowledge - the methodological affordances offered by building and exploring in three dimensions are potentially generative. When applying LEGO® SERIOUS PLAY® to the TCF by and on behalf of students, the *act of identifying* becomes central to surfacing the game - by constructing a whole systems view of the discipline over time, LEGO® SERIOUS PLAY® becomes a catalyst for revealing those insights that are not as readily surfaced through oral and written text. Such an approach helps students to negotiate and perhaps welcome liminal experiences and spaces to explore factors that affect their experience of liminality and stuckness. It also helps to move the experience of learning within and beyond rational, intellectual knowing to include the emotional, affective and non-linguistic dimensions of that learning. Conditions for learning that offer opportunities to engage with these approaches can be designed, or *meta-designed* (Wood, 2008) through the nexus of LSP and the TCF, building on a systems view that helps identify purpose and emergence within the complexity of a discipline.

The coherent, interconnected wholes created and examined through LEGO® SERIOUS PLAY® can therefore help provide points of focus for disciplinary awareness, and even act in metaphorical apposition to experiential learning in the field. The act of building models becomes an experience itself, with the approach fostering a way of perceiving or deepening understanding of abstract conceptions, for example. In the LEGO® SERIOUS PLAY® method, such an exercise is known as ‘playing emergence’ (Kristiansen & Rasmussen, 2014), where effects on the system can be acted out metaphorically, helping to perceive the dynamics of a system. By encouraging learners to construct a systems view of their discipline and the learning of that discipline, there is potential for learners to perceive the significant forces influencing their capacity and capability to learn, and to gain insights into their dispositions and their abilities to act, learn and research. Similarly, such insights can deepen educational developers’ understandings of student experiences, and as noted above, inform decisions when designing conditions for the learner to cultivate generative views of epistemes.

Conclusions and next steps

As a result of both our theoretical investigations and our empirical experiences of using LEGO® SERIOUS PLAY® extensively in a range of educational and research settings, we believe it, in an adapted form, offers a significant and generative methodology for creative enquiry into threshold concepts, liminality and the Threshold Concept Framework. We suggest that using three-dimensional approaches to explore these three areas fills a current gap in research literature around liminality and practice rooted in the TCF. Although limited in scale, our exploratory practice shows how the combined methodology can be effective at exposing liminal variation. We have also elaborated how, in our experience of students' articulated views, liminality takes many forms, which are not solely to do with grasping a threshold concept per se, but involve *threshold dispositions,* and practices that enable the individual to move towards mastery of their subject and a heightened level of self-awareness.

In the context of whole systems thinking we have proposed that consideration of threshold concepts takes place within disciplinary contexts that are a constellation of knowledges, behaviours, practices, habits of minds, and ways of seeing and knowing. Operating within this constellation, the individual is shaped by the acquisition of ways to perform within their field, as a practitioner, craftsperson, academic, industry professional or other, and is therefore engaged in identity work. From our experience we perceive value for staff, students and educational developers in viewing the discipline in terms of whole systems thinking, and in the threshold concepts that enable someone to become adept in this discipline as keys to navigating this system. Given the undercurrents of design thinking and systemic thinking noted above, curriculum designers can be concerned with building on methodologies that help design for purpose within complexity, and designing for emergence so that a learner can discover the dominant paradigms, and associated epistemes, practices, perceptions, and of course, threshold concepts within their field of study. In summary, we feel that the methodology outlined in this paper, which draws closely on application techniques developed in LEGO® SERIOUS PLAY®, offers significant potential for student and curriculum engagement with the Threshold Concepts Framework and associated explorations of liminality.

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List of illustrations

Figure 3. Keefer, J. (2014). *My metaphor of the liminal black box via LEGO® SERIOUS PLAY®.* Retrieved 16 October 2014 from: https://twitter.com/JeffreyKeefer/status/487540160557363201

Figure 6. Anonymous blogger from UAL SUARTS (2014). *Managing stuckness - LEGO® SERIOUS PLAY®* [Online] Retrieved 27th June 2014 from: http://suarts.tumblr.com/post/84529301907/managing-stuckness-lego-serious-play