MONASH University

Joining Practice Research

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A thesis submitted for the degree of Doctor of Philosophy
at Monash University in 2020

Monash Art, Design & Architecture

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Abstract

How might design practice join ways of becoming with collaborative research?

Design practice continues to shift with a 'social turn' that has reimagined how we evaluate and position the process of designing. This doctoral study recognises that the socially embedded nature of design has directed research toward the social and dialogic nature of designing. A practice of co-design embedded in this doctoral research is situated within a program of collaborative research, providing an opportunity for a practice-led research project to contribute to how we might form better knowledge around the ongoing re-evaluation of design expertise.

This project within a program situates a co-design practice within complex sets of social relations emerging from within this research setting. This complexity is conceptualised through the work of eco-anthropologist Tim Ingold, who describes the relational networks of humans and objects as an intertwined and knotted 'life of lines' in a constant state of becoming. An inquiry into becoming with the research engages the design-researcher in a state of methodological disorientation—a mode this study identifies as transformative learning.

Becoming is evidenced in how design practice shifts through the method of joining, adapted from Participant Observation. This research argues that joining enables the designer to learn within the disorientation of data analysis. Joining is developed through speculative experimentation into methodological disorientation, as antecedent design expertise integrates emergent knowledge as an ongoing transformation of design practice. Joining creates analytical frameworks that emerge through a speculative exploration.

This study asks: How might design join ways of being with practice-led collaborative research to shift toward ways of becoming—a mode of transformative learning? Consequently, the study examines how the researchers' design practice shifts through collaboration. The contribution of this study is a methodological inquiry into how designing might learn through collaborative research, providing useful insights into co-designing for designers shifting toward social design practices.

Keywords: joining, becoming, co-design, practice, collaborative, speculative,

Declaration

This thesis contains no material which has been accepted for the award of any other degree or diploma at any university or equivalent institution and that, to the best of my knowledge and belief, this thesis contains no material previously published or written by another person, except where due reference is made in the text of the thesis.

Dion Tuckwell

19/12/2020

Acknowledgments

I wish to acknowledge and pay respect to the Elders and Traditional Owners of the lands and waters on which this study was conducted. I acknowledge First Nations connection to material and creative practice which has existed on these lands for more than 60,000 years, and celebrate their enduring presence and knowledge. I pay my respects to their Elders past, present and emerging.

This research was supported by an Australian Government Research Training Program (RTP) Scholarship.

I take this opportunity to acknowledge those who have helped me along this path of doctoral study:

My supervisors, Lisa Grocott and Kate Coleman, for joining my research journey and exciting the possibilities with me (and within me), guiding emergent insights, and nurturing the curiosity that kindles doctoral research.

To Fiona Young, my PhD collaborator on the 'Making Space' project. Our project would not have been possible without Fiona's playful tenacity and sheer generosity. Fiona genuinely inhabits the spirit of collaboration. I would also like to thank all the teachers who engaged with our project and gave us so much of their precious time. Thanks to Vivienne Awad for your creative leadership and support. It was a privilege to be part of your world through conversations about practice.

I would like to thank all those in Wonderlab for the seriously playful conversations that stoked the liminal becoming vital to this PhD. A special thanks to fellow Wonderlabrador Allison Edwards for the time, boundless energy and resources shared with me as I embarked on this co-design journey.





This research was made possible through the generosity of the Innovative Learning Environments and Teacher Change (ILETC) program, an ARC Linkage Project (2016—2020).

My sincere thanks to Associate Professor Wes Imms for inviting me to be part of the ILETC.

Special thanks to Marian Mahat, Joann Cattlin and Sarah Healy, and to all those who I've met over the course of the program's productive duration. The invitation to collaborate with such an incredible team of dedicated researchers has taught me what it means to practice, share, and apply research.

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NB: An extended gallery of images is available at diontuckwell.com

Prologue

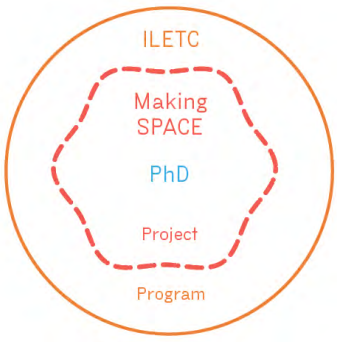
(a) The following PhD contains two texts—two *narratives*. The main narrative of this thesis formally communicates the exegetical text component of this research. This 'voice' contains an academic register appropriate for conveying the expectations of doctoral inquiry.

> *A second text (another voice), discloses what I refer to as a 'practice proof'. This narrative is entangled with the exegetical text; in conversation with the unfolding nature of this practice research. This voice recognises how design is a relational practice, and supposes that the relational develops from within a design practice—it is a 'becoming' that performs the uncertainty that in turn inhabits this study of shifting practice.*

> *To be clear, a 'proof' in this case is not the cogent transaction of 'evidence'. Rather, it is an impression of possibility analogous to the 'artists proof'. This transmits what emerges as a performance of uncertainty. The 'proof' emerges from within the research—deepening as the inquiry unfolds. The 'practice proof' impresses upon us as a provocation, prompting an engagement with emergence at the site of inquiry.*

> *This proof is akin to a prototype—a test of creative process. We learn and iterate from it. It reveals (revels in) an impression of the direction the design has taken us in. The proof makes our work visible and knowable. I'm 'proofing practice' throughout this research because I'm seeking an impression of the thing that codesign practice might reveal. The transferability of this approach is in how a design researcher might see their practice shift, and to make it possible to join this shift in meaningful ways.*

(b) This doctoral project was made possible by the 'Innovative Learning Environment and Teacher Change' (ILETC) program. The ILETC program seeks to investigate the affordance of 'ILE's' in Australian and New Zealand Secondary Schools, with a focus on how Teacher's best practice within these new learning environments. To clarify at the outset, the 'project' of this PhD is situated within the 'program' of the ILETC. Further elucidation of this relationship will unfold throughout this thesis following this basic structure:



(c) Finally, this PDF accompanies an 'exhibition' of the practice(s) that took place within this study. A gallery located at diontuckwell.com contains the thesis you are currently reading, alongside a more substantive collection of images and research artefacts as an exhibition of practice.

1.0 Context

Part 1 introduces and positions this doctoral research before a substantive project outline in Part 2 and analytical discussion in Part 3. Part 1 provides a research context that outlines critical concepts attending to the central concerns of this study—giving shape to a design practice joining collaborative research. This part established the theoretical frame, and methodological approach, critical to this study:

How might design practice join ways of becoming with collaborative research?

This part will, in turn, outline concepts accompanying the research design, situating relationships between the researcher, literature, theory and methodology.

- Chapter 1.1 positions the research and the researcher within the complexity of this practice-led inquiry. This chapter will introduce the investigation and establish a methodological framework, including an emergent structure of analytical sense-making.
- Chapter 1.2 provides a substantive theoretical outline of how joining practice-led research has been framed by this doctoral study. Keywords such as 'becoming' are given greater conceptual clarity, and theories are situated throughout this chapter to guide the reader through theoretical constructs activated by this practice-led inquiry.
- Chapter 1.3 outlines designing, co-design, and other practice(s) central to this thesis. This chapter clarifies terms like 'designerly' and 'speculative' through a reading of ideas and practices in attendant literature. What design practice looks like, in terms of how it manifests within this study, will be given attention through an explanation of project grounded research as a framework that contains this study.

1.1 Positioning the Research

Chapter 1.1 positions the research and the researcher within the complexity of this practice-led inquiry. This chapter will introduce the investigation and establish a methodological framework, including an emergent structure of analytical sense-making.

1.1.1 Proof of Practice

This practice-led research begins in a knot—

> *—that never bloody happens!*
>
> *The print technician growls at the proof—briefly wincing toward me—then back to the offending proof (as if we were all 'bloody' colluding). The proof was still so wet we were both smeared in the hot pink ink … it's a memory of my relationship with graphic design practice that now feels like a distant presence …*
>
> *Memories like these draw me toward practice-led design research.*

Shifts in my design practice compel this study toward states of contingent 'becoming'. I appreciate these shifts through the work of eco-anthropologist Tim Ingold (2015), who illustrates a 'knot' as a kind of joint that has "enduring conditions of becoming" (p.23). The knottiness of my antecedent practice contains memories of how designing has conditioned a central thematic frame of becoming. Memories of 'proofing' things from my graphic design practice previews this—

> *I loved handling these messy printed proofs—it was a joyous thing to take receipt of your work on a glossy sheet of freshly pressed ink. The precision of the printers' marks seemed to vindicate the fastidious typography … the tasteful art direction …*
>
> *I considered the proof to be much more than a formal transaction between designer and supplier. There was always something else going on. It felt closer to the romance of the 'artists proof'; a lovingly processual artefact that reveals an impression of the print process, energising the artist as it reiterates the creative effort and holds the possibility for further refinement. This is the kind of 'proof' that speaks to how my own creative inquiry has also become an impression of possibility, rather than a transaction of practice. What I discover is a portrait of practice that captures a sense of the emergence at the centre of the study. It has delivered me to better questions about how my relationship with design practice (and designs' relationship with the world) is undergoing a disorientating shift.*

This thesis attends to 'becoming' through emergent design practice, shaped through collaborative research. Joining this process requires shifting from a practice situated in service to graphic design, toward a practice shaped by collaborative learning. As an emergent practice, this is a pursuit of the possible through a specific and simple notion—how we join co-creative research. Practice-led inquiry occurs in this study at sites of collaboration with interdisciplinary researchers and participants. This opportunity freights my design practice toward meaningful examinations of collaboration—an analysis of how to join creative collaboration through research that informs an immanent practice of co-design. The ILETC program of interdisciplinary research that houses this doctoral study enabled experimenting with ways to make-sense of the sense-making so fundamental to what designers share with others.

> *I kept wondering—how could design shift with this 'social-turn' that has radically re-imagined the role of design in the 21st century? It's so disorientating. I wonder how design could generate real knowledge about how creative collaboration is calibrated by the social—by how we grow and become with one another through materials and making. I recognise this as a design process of forming the world through the social imagination—and leading new worlds into becoming active and effective.*

This practice-led research seeks to investigate how shifts in design *practice* toward collaborative *practices* might be better understood through research—engaging with interdisciplinary research compelled shifts in my designing toward more collaborative modes of practice. This shift supposes an expansion of design practice seeking to understand in what ways practice might shift from being a designer toward becoming a co-design practitioner.

Doctoral research has followed an opportunity to join a significant interdisciplinary research program where creative collaboration is folded into the program methodology. Crucially, the installation of a co-design project within this program enabled this practice-led PhD to capture data of the designer and participants working creatively and collaboratively. Collaborative-creation at the site of this study assisted participants in making up conversations as welcome exhortations of their practice. Video capture enabled an exploration of the workshops as imaginative 'portraits', and I examined these portraits informed by my expertise as a design practitioner. This process helped position me within my practice. I designed the workshops, and I participated in them as a co-facilitator, assisting and joining teachers.

This research reveals ways of 'joining' as a mode that shifts toward a whole design practice. Research activity shifted from examining practice as it is, toward an analysis of practice coming into being—a framework of sense-making emerged from within the exploration. This emergence reflected the nature of practice-led research and became indicative of how methods followed a similar path of developing as they unfolded from within. To meaningfully engage with data was to engage with methods created for the participants—methods carried by a material playfulness designed to allow 'making' to be revelatory. Similarly, I discovered that creating instruments to see my practice helped position my practice within situations of creative collaboration.

> *Early on I'm stuck on the question: how might the relational and contingent nature of designing describe the contribution design makes? That is, I always sense how design exists, or is even defined by the 'in-between' and sets into motion disciplinary knowledge as a state of becoming. This has always beckoned an imaginative relationship with design toward what has always felt so unknowable. Do we know how to know this? I turn my attention to the disciplines adjacent to my research puzzle.*

1.1.2 Project within a Program

The Project — Making Space

This PhD research conceived 'Making Space' as a project situated within the 'Innovative Learning Environment and Teacher Change (ILETC) program. 'Making Space' is critical as the container for this doctoral study and will be given substantive description and analysis in Part 2 & 3 of the thesis.

Making Space is an exploration of co-design within this practice-led research. This project is situated within and determined by two separate but overlapping doctoral studies: an interdisciplinary inquiry of Participatory Action Research (PAR) and a Co-design practice-led research that explores teachers' practice development in relation to new learning spaces associated with the ILETC program. Fieldwork was conducted at two secondary schools – both seeking to develop new pedagogical practices amidst the process of transitioning into ILEs. The studies engaged teachers as both participants and co-researchers, involving them in planning, enacting, and reflecting upon pedagogical development amidst the process of shifting into new learning spaces.

Data generated by Making Space forms the ground for a methodological inquiry central to this doctoral study. Making Space contains the practice at the centre of this study. This speculative practice imagines how we might shift co-designing in ways that understand our relationship with modes of becoming. Emergent methods of analysis are described alongside detailed illustrations of practice and practice-led methods associated with research activity.

The Program — ILETC

The ILETC program is an Australian Research Council (ARC) Linkage Project funded for four years from 2016-2020. This PhD is one of eight on the ILETC and the only doctoral research with a practice focus. The program investigates how teachers can use the untapped potential of 'Innovative Learning Environments' (ILEs) to improve learning outcomes for students. It's seeking to identify a link between quality teaching and effective use of ILEs and develop practical tools to assist teachers in adapting their teaching practices to maximise deeper learning. Innovative learning environments (ILEs) are commonly emerging in place of traditional classrooms in Australian and New Zealand schools, intending to support more student-centred pedagogies, as opposed to teacher-centred instruction (Paniagua & Istance, 2018; Imms, Cleveland, and Fisher 2016). Designed to facilitate a variety of collaborative, participatory, and independent teaching and learning approaches, ILEs may 'become' effective socio-spatial contexts for learning as "the product of innovative space designs and innovative teaching and learning practices" (Mahat et al., 2017, p. 8).

'Teachers as Designers of Learning Environments' (OECD) (Paniagua & Istance, 2018), asserts that pedagogy must be combined with expertise in the design of learning spaces for teachers to get the most out of ILEs. The report makes explicit the relationship that teachers could have with design: "It is precisely through the idea of teachers as designers of learning that innovation at the level of practice can be seen as a normal side of the teaching profession to solve the daily challenges in a context which is in constant change" (Paniagua & Istance, 2018, p. 21). The report goes on to state that there is a clear relationship between the role of design in schools that lends itself to teacher expertise: "Teacher learning—collaborative, action-orientated, and co-designed—is fundamental to change" (Paniagua & Istance, 2018, p. 43). For the ILETC program, a 'design thinking' approach responds to the suggestions of this OECD report, inviting a practice-led collaboration with design to investigate what is needed to activate these new ILEs. Like the OECD report, this study appreciates how well-intentioned architectural design has given shape to the emergence of ILE's—but how could engaging with co-designing bring them to life?

The ILETC program collaborated with Wonderlab, a Co-design Research lab at Monash University in the Department of Design. As a core member of Wonderlab, I work with other doctoral candidates on a variety of speculative projects and PhD focused research. I also teach Design at Monash and appreciate the role of the research lab in contributing to the research culture within the design department. Wonderlab engages a co-design-based research approach to questions around how we might better understand design learning. During the early stages of the ILETC, workshop projects were co-designed with Wonderlab as encounters that surface teacher mindsets and beliefs surrounding the use of and transition into ILE's. Research has developed an approach to co-design, inquiring into how design might shift teacher behaviour by making social practices more knowable. Wonderlab proposed a series of complimentary co-design workshops instead of typical 'information sessions' or 'focus groups' allowing messiness of teacher experience to inform the research ideation in the early stages. ILETC initially perceived these workshops as significant to establishing stakeholder engagement and 'buy-in'. However, as the workshops progressed, this significance expanded as key knowledge building for the program. The workshops started to reveal how creative teacher engagement is a key to participation in the study. Workshops surface tensions in a productive and revelatory way and the role of co-design on the project emerged as a significant contributor to its methodological inquiry and research design.

1.1.3 Thesis Outline

There are three distinct parts to this thesis:

- Part 1 outlines the context of this research, including critical concepts that positions the study and the researcher. A methodological overview will introduce and detail how this practice-led methodology is structured. Included is how the project (PhD) is situated within an interdisciplinary program (ILETC) of collaborative research. Theoretical framing will further situate this PhD study as a 'joining' of collaborative practice-led research to a methodological inquiry.
- Part 2 outlines the practice-led project and site of research fieldwork ('Making Space'). This project is key to how I join with participants in the field and adapts the method of joining from the strategies of Participant Observation (PO). A research design reports on our approach to the Making Space workshops, and the implications of the project for the research discussion, given substantive attention in part 3.
- Part 3 develops the significance of the methodological inquiry. 'Joining' methods is an analytical framework of speculative sense-making. It is presented as a vital contribution of this doctoral study and an original contribution to how we might learn from co-design practice through research. This part considers joining as a material and embodied process of becoming.

An interrogation of my relationship with data is developed as a speculative study through experimentation as a way to inhabit sites of inquiry (Stengers 2008). This doctoral investigation considers ways in which design research can create methods that better express the contribution design expertise makes in collaborative research contexts. Research contends that engaging creative strategies affords imaginative, inventive and intuitive methods—all familiar to design practice. These innovative strategies reveal a research process that occupies a productive 'disorientation' of transformative learning (Mezirow 1990). Practice emerging through research shows we can join data analysis as a transformative practice.

1.1.4 Research Inquiry

How might design practice join ways of becoming with collaborative research?

This research locates an immanent practice of *becoming* through a process of *joining*. I conceptualise 'joining' as a meaning-making process corralled through the practice of design. The term 'joining' is adapted from Participant Observation (Peterson et al., 2010) as a method of inquiry into data derived from collaborative practices within interdisciplinary research. The practice at the centre of this study develops from antecedent models of design that focuses on the designed artefact, toward a sense of design as an agent of social learning and collaboration (Grocott, 2019).

An invitation to work on the ILETC program provided the setting to situate this research question. A contribution to knowledge is developed through an experimental approach to practice-led research. Projects grounded in the ILETC program afforded an opportunity to experiment with a practice-led inquiry into how design in service to interdisciplinary research programs might generate research-led shifts in design practice. I reflect on my practice as a designer setting out on a co-design path, learning how to build a collaborative practice from the inside-out. This doctoral research is situated in interdisciplinary research and seeks to develop knowledge through intra-disciplinary inquiry.

My experience of graphic design practice has been framed by design that services a clients' patronage. It's a model of designing that was taught to me at University and one that continues today. This is design as a noun; as a concrete commercial endeavour. As a design educator I've taken this model as a provocation—what might it mean for *designing*—for the processual nature of design as a verb? I associate *designing* with our natural inclination to learn from the world. Teaching design has led to an active engagement with students

who naturally question their burgeoning relationship with *designing*—to do design. This has inevitably led to me shifting my perception of designing, one that has appreciated the expansion of design as a way into understanding the world, a way to research and learn. I have taught (and learnt) design, and I have taught (and learnt) through designing. A reappraisal of what it means to practice design is an underlying catalyst for pursuing research through this shifting sense of what *becoming* a designer means.

> *This opportunity to research across a messy and uncertain collaborative practice space opened up possibilities to shift designing through research, asking better questions and seeking a whole practice. The whole here is simply highlighted in contrast to the part. So far I've encountered parts of a codesign practice, and my intellectual drive is toward knowing how to make those parts speak to each other—to make a conversation that reveals the relational and builds better ways of knowing through practice.*

Grounding design practice within the ILETC program establishes a 'laboratory'(Vaughan 2017, p.101) for experimentation. This situates experiments as iterative and evocative encounters with data, creating knowledge with an openness to emergence in practice and data. Through interrogating designs' relationship to practice, this research seeks to develop the social imagination of design. That is; an imaginative practice that turns the affective language of materials toward meaningful analysis. I argue that through collaborative research, we might build better modes of practice-led analysis that situates design becoming with others. The materiality of this analytical mode is key to how I develop the object of this research.

The outcome of this research contributes to the practice of co-design by developing ways to ask better questions of practice. Research interpolates practice as a mode of learning that I embody through my hesitations, worries and struggles as a researcher. This study is an embodiment of becoming closer to the purpose and possibilities of co-design practice.

1.1.5 Methodological Overview

The following section outlines the methodological adjacency within this project-grounded research, including a conceptual outline of key concepts that have informed methodological inquiry.

Fieldwork undertaken as part of this study negotiated a complex entanglement of methods associated with large scale research projects such as the ILETC. Research work at the site of the project is situated by a Participant Observation (PO) of a Participatory Action Research (PAR) project that is embedded in the ILETC program. The following methodological outline will detail how a practice-led research strategy chose methods appropriate to the intent of this inquiry. Attending to the choice and application of methods, chapter 1.2 situates how theory framing these methods provides a philosophical stance behind the methodology.

This doctoral project appreciates methodology as the systematic, theoretical analysis of the methods applied in this research (Crotty 2020). The methodology offers a theoretical framework for understanding which methods, or best practices, are applied to the project space of this inquiry in response to the research question. This section posits that methodological adjacency emerges new approaches to understanding how we make meaning from data produced through co-designing within collaborative research. A broader discussion is applied in Part 3.

Developing an analytical framework adapted from Participant Observation (Schensul et al., 1999) situates how I join participants and data in this research puzzle. This approach aligns with thinking on how we frame both the design and the design practice as a way of inquiring into the design process, and draws attention to how narrative flows in the design process (Lloyd & Oak 2018, Dorst 2015, Paton, B., & Dorst, K. 2011).

Practice-led Research

Methodology emerging from within this practice-led inquiry is corralled through a Participatory Action Research (PAR) (Denzin and Lincoln 2005) study that employs a Co-design (Melo 2018) practice-led approach to frame participation. This, in turn, establishes a collaborative approach to engaging with a methodological inquiry that is grounded in a shared project: Making Space.

This methodology identifies practice-led research as a central framework. Practice-led research is conducted through designing alongside embedded and situated theory. This focuses on the nature of practices that lead to new knowledge significant for the operation of that practice (Candy 2006). As a practice-led researcher, I'm concerned with how practice-led inquiry advances knowledge about practice, from within practice (Smith and Dean 2009). A practice-led inquiry is, therefore, a significant part of this methodological framework.

Co-designing: Workshops as Research

Workshop design engaged with methods that enable generative, collaborative activities that explore assumptions, surface beliefs and reveal the mindset of teachers and participants engaging with ILETC research. Workshop participants were explicitly asked to show, rather than tell, their stories of what they were feeling and to playfully engage with prototyping their ideas (Royalty and Roth 2016). Using a framework developed by Sanders et al. (2010) the workshops guided participant between;

- Making tangible artefacts;
- Talking, telling and explaining;
- Acting, enacting and playing (Sanders et al. 2012)

Methods: Workshop

Conversations were framed through a practice of co-designing with participant-teachers, who were asked to explore, through collaborative making, the intrinsic values that drive their practice. An assumption guided this—when latent values are surfaced, design-led workshops have the capacity to generate rich conversations that have meaningful connections to professional learning (Sanders and Stappers 2012). These methods developed in response to the possibility of learning through design, an iterative process given focus in Part 2; Making Space.

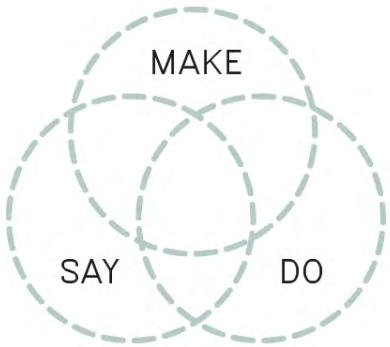


Figure 1: Say, Do, and Make tools and techniques reinforce each other (Sanders 2012)

Workshop methods follow the practice of Liz Sanders (2012), who claims that the best way to approach the organisation of tools and techniques that drive innovation is by being people-centred (Sander, 2012, p.66). The workshop methods focus on the activities of the participants rather than the researcher or the data. A turn

toward data analysis occurs during experimental methodological inquiry (Part 3). However, the design and development of workshop methods follow Sanders in observing what people do, what they say, and what they make (Say/Do/Make, figure 1). Through this framework, designs' most potent contribution is through 'make'. In the context of our methods, we asked teachers using innovative learning spaces, to make a model of a classroom that reflects how they currently use the space, or how they could be using the space more effectively. This permitted participants to dream about the potential of space through a making process, a creative process that leads to conversations and reflections on their teaching—what works, what could be improved, who needs to be part of the conversation?

The confection of Say/Do/Make is multifarious. Say techniques involve familiar forms: questionnaires, polls, interviews are all aligned with the Say technique as a way of getting answers from people by asking them questions. Say techniques come is a variety of 'objectiveness' as questions can be framed in very subjective terms. Interviews probably have the greatest level of flexibility to learn from people as there is scope to shape the direction that questions and answers go. In other words, the interview can be more conversational and free form.

According to Sanders (2012) Say techniques can go a little deeper than Do, as participants can express more through their 'voice'. The receiver in a Say technique colours the response by his or her interpretation. Likewise, the sender colours the message, for example, by answering what the receiver wants to hear. Therein lies a dilemma at the heart of the Say/Do technique: what pole say is different from what they do. People do not necessarily practice what they preach, or they may express views to cast themselves in a particular light. When using the Say techniques we consider:

- Who talks? Interviews can take on many variations, and the decision of how the interview should be structured and facilitated should be carefully considered alongside the desired outcomes;
- Is there a predetermined structure? From basic questionnaires to more free form conversations, this must also fit the purpose;
- The media/form dimension. This point regards the form the conversation will take. Through the mail? Zoom? etc. This dimension will also determine how the Say technique is documented.

Do techniques involve observing people: their activities, the objects they engage with, the space in which they conduct these activities. The person doing the observation can be the research, or it could be the participants themselves. In Say/Do/Make, Do is the closest to a 'scientific' practice as it suggests the facilitation by unobtrusive research who 'objectively' observes and reports on the workshop. It should be noted that there are significant limits to how objective ones can be. Often this is just impractical. There are tools for capturing the 'Do' process that could assist in preserving objectivity, or the lack of objectivity itself needs to be factored into the outcomes of the workshop (Sanders and Stappers 2012). When studying what people do, we consider:

- Who does the observation? Researcher-as-observer?, or participant-as-observer? or a hybrid of both?
- How intrusive is the research? From hidden cameras to researchers accompanying participants, obtrusiveness must be appropriate and measured;
- What media is being used for documentation? Likewise, this must suit the intent. New media has opened up possibilities, but sometimes pencil and paper is better for getting to undistracted outcomes.

Finally, Make strategies involve the practice and process of designing. We can get participants to make things as a response or expression of their thoughts and feelings. Make techniques form part of a suite of generative techniques—as pathways of expression. These pathways become crucial and are carefully crafted by the research team. They might elicit the recall of memories, making interpretations and connections, explaining feelings, or imagining future scenarios or experiences. Creating a pathway that is fit for the study is a crucial skill and central to the success of the Do exercise. It is also vital that the materials of the pathway are married to carefully considered instruction and facilitation. How the participants are instructed and supported enables the pathway to facilitate the emergence of new understandings.

The use of generative pathways are many and varied, however central to their usage is the creative process—there is usually an outcome of a material or made artefact, and in making artefacts, we are engaging with designing. This involves synthesising ideas (Kolko 2011) and making sense of ambiguities. It is engaged as a powerful method of reasoning as confronting the 'messiness' of a problem forces abductive thinking processes to make the latent more explicit. These methods outline the approach to a variety of workshop encounters within this study. The practice of co-design, in collaboration with PAR, shifted through this interdisciplinary paradigm.

Methods: Participatory Action Research (PAR) and Co-design

Making Space is a collaborative effort, designed as an innovative methodological pairing of PAR, and Co-design. The PAR research process followed the typical action research spiral of planning, acting, observing, reflecting, re-planning, new action and observing, and further reflection (figure 2)

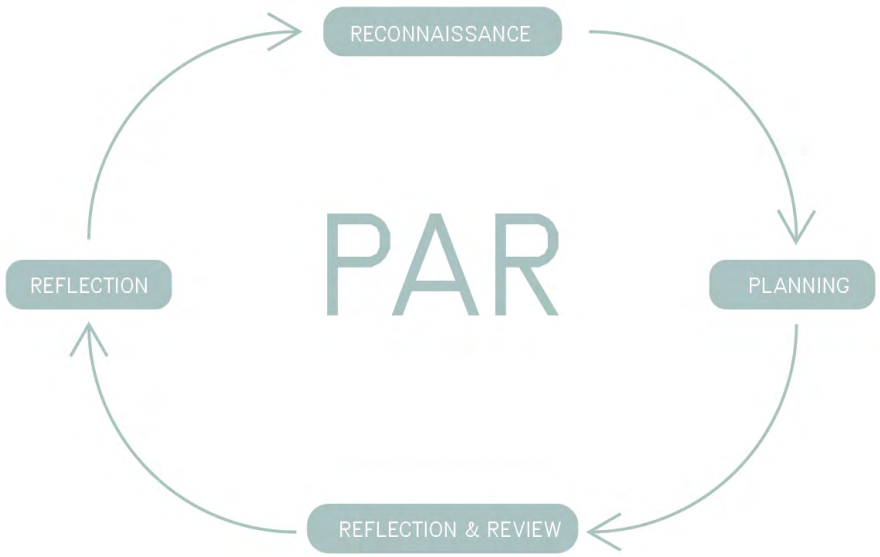


Figure 2: An action research spiral within a PAR cycle

This PAR cycle was established by a PhD colleague on the ILETC program, and together we conceived of 'Making Space' as an embedded project that both locates her inquiry and situates my practice of co-design within the program. Co-design was installed within the PAR cycle as part of a practice intervention, seeking to establish richer participation from the PAR constituents.

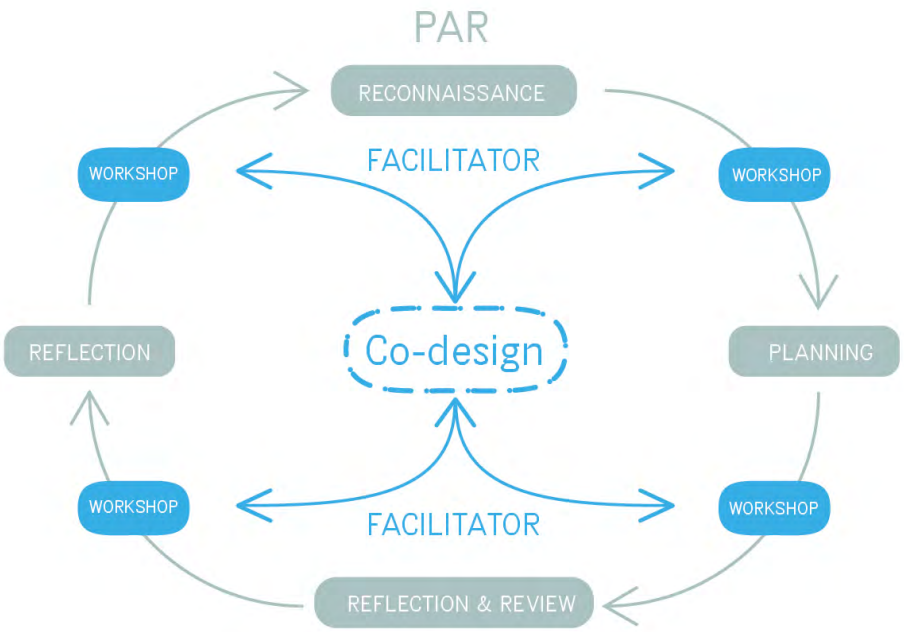


Figure 3: Installing co-design methods within a PAR cycle

The installation of a co-design approach initiated responses from participant teachers being led through a PAR process (figure 3). A practice of creative collaboration with participants was activated by workshops that were framed by the research questions inherent to the PAR study. These questions are significant for the PAR study. For this practice-led study, the PAR questions were prompts for the design of the workshops. Data gathered from workshops would be directed toward the methodological framework emerging from within this meshwork of collaborative research.

The outcomes of the participatory encounters led to an iterative approach to workshop design—each workshop built on the preceding experience. A full description of the workshops is given in part 2 of this thesis. Iterating workshops situated the designing from within the community of teacher-practice we were engaging with.

This methodological inquiry focuses attention on analysis of workshop outcomes rather than the processes of the workshop design. The workshop design, although significant to the practice, is considered to be in service to the ILETC program and is not the *research* focus of this inquiry. It is the outcomes of the workshops, and how I engage with the sense-making of data analysis, that forms the focus on this methodological inquiry. This has been conceptualised through adapting and developing methods of 'joining'.

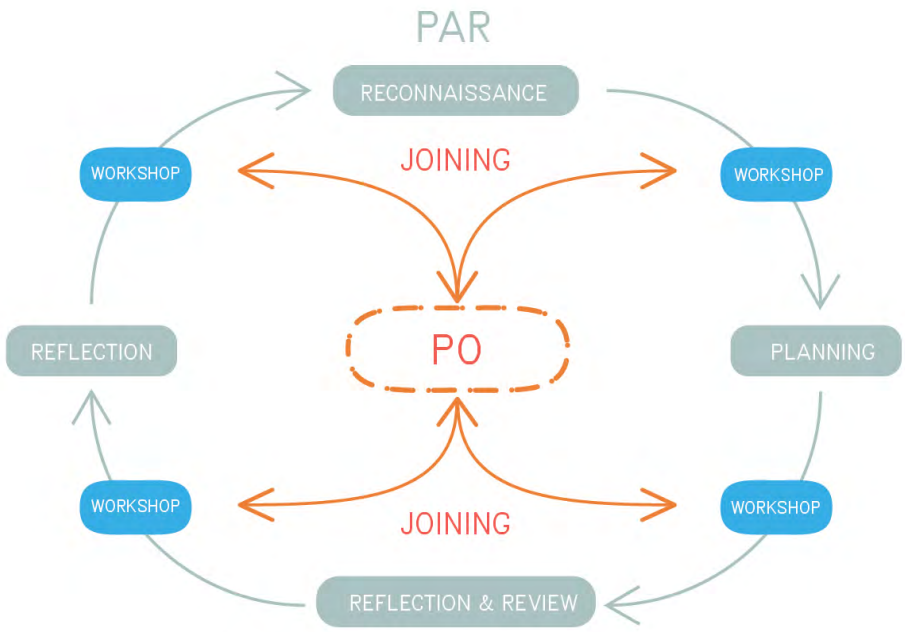


Figure 4: Joining the Process

Methods: Joining

I established an initial relationshiop with the PAR process as co-designer facilitating workshops. Collaboration has been situated within this methodological framework as 'joining'—a method of PO (figure 4). As a PO joining a PAR, I begin to conceptualise what it means to join through practice. This process of joining advances through the research as I intentionally shifted 'joining' toward a mode for inhabiting the whole inquiry—how I learnt through this process is itself an evocation of 'joining' with processes of 'becoming'.

Joining is adapted from Participant Observation (PO) (Kawulich 2005; DeWalt, DeWalt, and Wayland 1998; Schensul, Schensul, and LeCompte 1999) and established an active mode of engaging with data emerging from the Making Space project. Joining becomes closer to a practice of designing as it absorbs the reflexive dialogue of design in conversation with the material affect of collaboration—the designer 'joins' an unfolding practice through research.

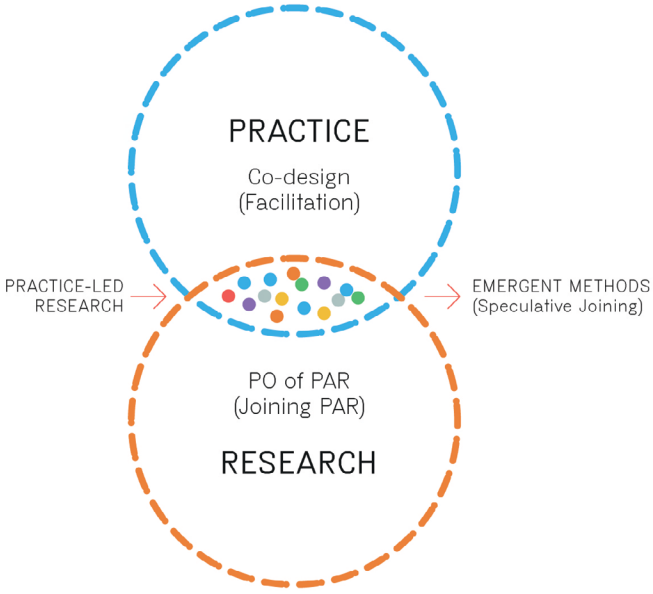


Figure 5: Locating a 'speculative joining' emerging from within PO joining a PAR.

Figures 5 & 6 describe how the expanding notion of 'joining' taking a speculative approach—joining becomes situated as a speculative practice of experimentation. This led to a 'speculative joining' as a set of emergent methods I conceptualise as 'knots'

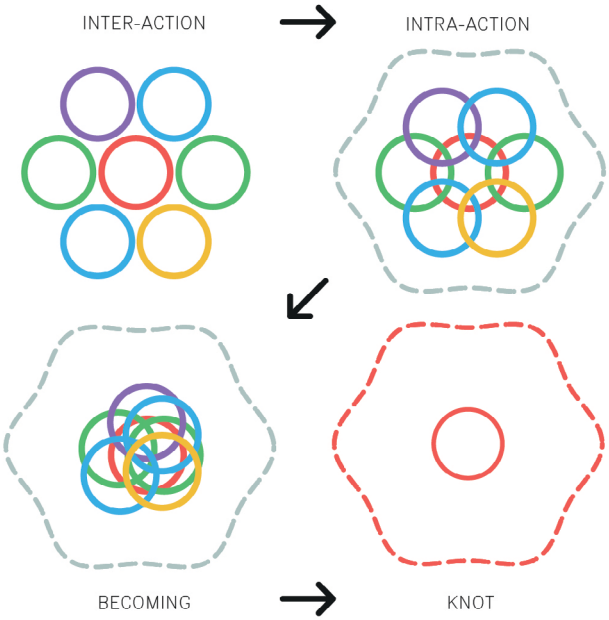


Figure 6: From methods of interaction (being with the data), toward 'knots' (becoming with the data).

In this way, 'joining' becomes a creative act of discovery and exploration. The methods, interacting with the data analysis, transforms into a 'knot', conceptualised using Ingold's notion of becoming. From interaction with the data, analysis inhabits a mode of inquiry that reflects the affective texture of the workshops that generated the data. The methods remember the makerly modes of play and creative invention that the teacher-participants of PAR experienced. These 'knotty' methods are embodying the act of joining through an intra-active process of analysis. For the researcher, this is not looking at what the data is saying, but becoming with the data through creative speculation.

Methods: Purposeful Knots

The 'knot' becomes a method that shifts my practice toward inhabiting the inquiry as a process of learning (becoming). This is evidenced in how a 'knotty' method shifts how I relate to the data—a method that changes my relationship to the data to one of deliberate disorientation—a scripted methodological dilemma that provokes processes of transformation.

The knots' "enduring condition of becoming" emerges from within the speculative joining. The knot completes the formation of a methodological inquiry which developed as it unfolded through an experimental approach to data analysis. Speculative joining became a way to learn with the disorientation of data analysis. A more substantive and expanded discussion around joining, and knots, is provided in Part 3 ('Discussion').

The purpose of the program (ILETC) is framed, explicitly, by a set of broadly stated research aims. The purpose of the practice (PhD/Making Space) emerged through the implicit and emerging development of relationships between the participants and the program. To establish, through co-creative methods, a set of concepts for approaching the research projects core suppositions. The purpose of this doctoral research is in establishing a curiosity that re-positions design through the program and asks how this re-positioning of purpose has shifted the practitioners underlying practice values.

> *As a designer, I created knotty methods. As a researcher, I reveled in the activation of knowledge entanglements.*

As a design researcher, this study seeks to understand methods through research. I contend that design that understands method and theory is more conscious. To be aware of the assumptions and implications of the practice is to see it whole. If we take methodology to be processual—looking at methods with active theoretical appraisal—this research argues design must develop new ways of becoming; learning through practice change that I seek consciously and purposefully.

1.1.6 Positioning Experimentation

Joining Possibilities

This study follows Findeli (1998), developing a practice posture of project-grounded (Making Space) research embedded in a program (ILETC) (see 1.3.5). Experimentation within the project, positions this practice-led research (and the practice-researcher) within a deliberate mode of 'becoming'.

The ILETC program installed a design thinking approach that engaged teachers seeking to augment conversations that occur with teacher-participants. This program of design thinking situates the suppositions or 'hypotheses' made by the ILETC (Binder and Brandt 2017) that has invariably directed this PhD project. However, from within the 'hypothesis' emerged a practice of experimenting with research methods that situate the attendant co-designing, and analytical framing. Design practice is typically framed by the services and outcomes delivered by the designers. In the case of ILETC, design thinking, and the co-creative approaches

to generating imaginative conversations is in service to the expectations of the program's broadest research intentions: how teacher practice is changing in line with the implementation of ILE innovations. Research in this doctoral study found a 'voice' in the Making Space project, situating the possibilities project-driven experimentation—Making Space.

This project recognises that the possible is always contingent, and it is through research that we might convincingly make arguments that positions possibilities (Stengers 2015). It is positioning the possibilities of experimental methods grounded in the project that sets this doctoral research in motion (Brandt et al. 2011). A more extensive discussion on what it means to 'experiment' in the context of this research is provided in section 1.3.4.

Developing a Practice from With-in

Figure 7 describes the progression of this doctorate from the initial project being conceived within the program, toward an inverted state of a program within the project. This expansion recognises how a limited practice of co-design in service to the program grew through research processes to become a site of knowledge creation informing the program.

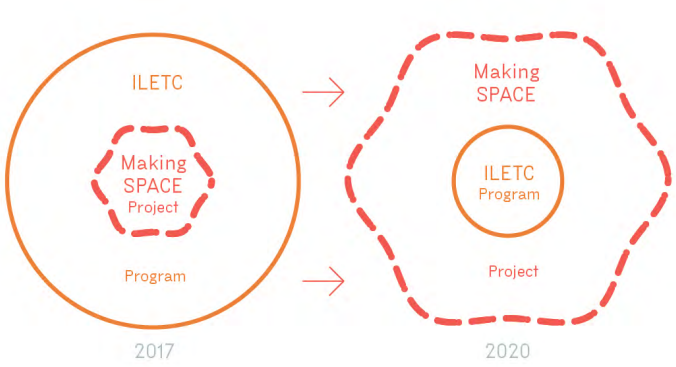


Figure 7: Practicing co-design on an interdisciplinary research program provides an opportunity to develop and examine project-grounded research—a pracitce with-in.

This progression of becoming develops as it unfolds, revealing ways that practice-led research has shifted my relationship with a collaborative research program from being a practice with-out (on the outside of the program looking in), to practicing with (co-creation with participants inside the project), toward becoming with-in (joining research through practice).

Throughout the doctoral research, Making Space amplified a sense of the agency of design-research becoming in tune with sites of collaborative knowledge creation, leading to a greater sense of how designing might contribute to interdisciplinary research.

1.2 Joining the Research

Chapter 1.2 provides a substantive theoretical outline of how joining practice-led research has been framed in this doctoral study. Practice-led research recognises that theory develops a perception of practice expressed through language located within that practice, constructing a shared reality through language (Althusser 2018). This chapter attends to keywords such as 'becoming', and theories are situated throughout this chapter to guide the reader through theoretical constructs activated by this practice-led inquiry.

1.2.1 Situating Theory

Doctoral studies in design engage different forms of fabrication or making—and this includes the making of theory (Redstrom 2017). Co-design within this study engages with and through theory to develop a conceptual framework as a critical part of practice-led research.

Thomas Markussen (2017) raises a fundamental question for design researchers: can design work lead to theory? (p.87). Markussen speculates if a 'theoretical design science' is possibly too restrictive. It is a critique that aligns with Gaver (2012) and Bowers (2012) who argue that the goal of theory in research through design (RtD) is essentially different to that of science. That is; 'theories produced by RtD are not falsifiable in principle' (Gaver 2012, p. 940), they are not evaluated according to whether or not they hold or provide meaningful interpretations of an existing reality. Design theories are not confined to descriptions, explanations or predictions of existing realities. These considerations are taken into account when conceptualising the theoretical framing of this study—how I choose theoretical frames, and how they are made through a designerly (Cross 2006) lens. There have been efforts to model this for design research. Haynes and Carroll (2007) argue for designs as embodied hypotheses that could lead to theories. According to them, the founding of these research outcomes might be evaluated from the philosophy of science; a theoretical design science that is purposeful, illuminating and grounded.

However, Markussen (2017) describes how design theories take on a different form, that they tend to be more provisional, contingent and aspirational, or what Zimmerman et al. (2010) refer to as 'nascent theory' (p. 312). A 'guiding philosophy' (p.90) might be concepts that help sensitise or direct designers and design researchers when reframing design problems (Zimmerman et al. 2010). Or a conceptual framework is another common form of theory where design researchers borrow concepts from other disciplinary areas and apply them to design. This research draws on conceptual frameworks from practice theory, alongside concepts from PO, in order to build theory into the study. Gaver (2012) asserts that this might inspire new designs or design practice.

1.2.2 Becoming: An Outline

'Becoming' as Speculation

The complexity of relational concepts embedded in this research is conceptualised through Ingold (2015), who describes the relational networks of humans and objects through a 'meshwork' metaphor—an intertwined and knotted 'life of lines' in a constant state of becoming (Ingold 2015, p.22). This study develops these concepts through a speculative lens.

Speculative researchers seek to examine processes of becoming through 'social dreaming' (Dunne & Raby 2013), a practice that engages creatively with the latent possibilities of the present, working with methods that enable the becoming of possible futures. This socially embedded practice has propelled researching the social and dialogic nature of the design process. Design practice continues shifting with this 'social turn' (Lloyd, 2019,

p.171) that has re-imagined how we evaluate and position designing and the designer (Oak & Lloyd, 2016). The Making Space project has been driven by these shifts and frames theoretical analysis through notions of 'becoming' a researcher.

Situating the designer learning through speculative research deviates from the 'pre-formatted geometry' (Wilkie et al. 2017 p.25) of 'predicting' futures and instead aims to build a capacity to emerge through the temporal—'responding to the insistence of a possible that demands to be realised' (Stengers 2015, p. 19). In turn, this research project does not seek to predict future practices; rather, speculative capacities provide an opportunity to experiment with processes of becoming (Michael and Wilkie 2020). This study therefore positions designing as 'becoming' through the experimental frameworks that emerge with design practice through research, constructing a relationality which contributes to knowledge of designing. This relationality critiques 'design thinking' as a practice that cannot be planted into complex sets of social relations—especially in interdisciplinary research—and must instead emerge from within research (Boelen et al., 2020). It is through a speculative framework of becoming that I appreciate how we engage with the social through the material and relational nature of designing—and that this both troubles and disorientates my sense of what it means to be a designer.

I design with a sense of exquisite disorientation.

'Becoming' as Learning

As the 'knot' becomes conceptualised through method, my practice is reorientated toward inhabiting this inquiry as a process of learning (becoming). I recognise this process through Mezirow (2000) who describes a 'disorienting dilemma' as an integral catalyst for 'Transformative Learning' (TL). This is identified as a learning experience triggered by a life crisis that leads us to challenge our assumptions, leading to a transformation of beliefs and values (Taylor, 2000). Since the promotion of Mezirow's model of TL, research has revealed greater complexity at what we might mean by a 'dilemma', and how it can be connected to learning (Merriam and Clark 1991; Daloz, 1999). Merriam and Clarke (1991) for example, describes 'integrating circumstances' (p. 177) that might lead up to the development of a disorienting dilemma. These may not necessarily be 'crisis'-like. There is still much to be uncovered about the nature of a disorienting dilemma and how it comes about as a catalyst for transformative learning (Laros, Fuhr, and Taylor 2017).

This 'disorientation' experienced in this research aligns with the likes Nohl (2015) who has described a TL process as starting with the integration of new practices into existing ones. In this case, there is no 'crisis' at all (Laros et al. 2017, p. 85). Nohl's studies have shown that a 'disorienting dilemma' might be better understood as an "unfolding evolution" (Laros 2017, p.176) which leads to potential shifts in perspective. This differs from the negativity implied in Mezirow's 'crisis' framing of a disorienting dilemma and instead exhibits positive affect as the catalyst for the integration of old and new practices. This approach to transformation galvanises self-empowerment rather than any implication of diminished personal agency associated with the notion of a 'crisis'.

The eponymous 'proof of practice' previewing this exegesis is not one of crisis—I appreciate it as a moment of 'unfolding evolution'—a fragment of practice that forms part of the whole disorientation central to this study.

The 'disorienting dilemma' that seeded motivation for this doctoral study is a sense of how formless design practice has become—and how this diminishes a sense of positionality in collaborative research.

Irish poet Pádraig Ó Tuama (2015) describes how poetic form can help hold things in us that feel formless—and in that internal formation, we find space to name the things we seek to learn and understand. I wonder how I might imagine these forms, and how this might reveal a practice that develops from being a designer (in service to—), toward becoming a design-researcher (learning with—)? This question haunts my practice.

Becoming a 'Navigational Vector'

I'm curious as to what form of poetic navigation might guide my practice in a way that educates my imaginative attention (Ingold 2015, p. 134)—making visible a relationship with the possible by creating frameworks for analysis.

According to Rogoff (2014), knowledge produced through creative practice enables us to question how we might know what we don't yet know how to know. Rogoff posits a need to change the language we use to access and assess 'knowledge', and to search for new terms or a different set of research aspirations (Rogoff 2014, p. 132). According to Rogoff, this 'not-yet-known-knowledge' requires an emergent language. The terms that emerge through such inquiry become the building blocks or 'navigational vectors' (p. 132) for learning that is not preoccupied with measuring success - one that is content with merely trying. Following Rogoff's critique of knowledge, design research is an emergent field of significant epistemological disorientation. However, in the spirit of Rogoff's critique, this disorientation might be useful in how it reveals to the design practice-researcher, ways to make known the impact of their practice, through their practice. To know what we still don't know how to know is a disorientating technology for creating knowledge.

Rogoff posits that an epistemological crisis allows us to consider absent knowledge and to propose new research methods. This isn't limited to building new ways of operating as researchers; it offers a letting go of ways of thinking as a deliberate invitation to 'try on' new modes of knowing. Making Space moves to 're-compose' design practice through research that permits the emergent to take hold—an unnerving and vulnerable state of becoming.

Becoming With—

This collaborative research recognises that effective design practice comes about by working with people rather than for them (Grocott et al., 2019); a supposition that forms and informs the basis for how I 'become' with my practice alongside data generated with participants. Data analysis of co-design workshops interrogates better ways to understand the 'other' we work with. Understanding the others we work with supposes that we must learn to pay attention to practice in ways that move from being with others, toward a developing practice of becoming with—

> *It's as if my design practice has felt with-out—I learn with the unfolding disorientation of this research as it pulls designing with-in—giving form to the formless qualities of becoming I'm looking for.*

A theory of becoming with design practice through data analysis is developed in Part 3 of this thesis, appreciating how learning in design research occurs as the designer becomes part of the research process (Findeli 2001)—how the designer shifts with this research process.

As design practitioners, how might we become closer to our discipline in the context of the social habitat of practice?—the social world in which design exists. This positions design as an ontological medium that shapes our actions and in turn, generates our worlds (Winograd & Flores 1986). The work of design shapes our social imagination, and this research recognises how the experimental nature of 'social' design is a powerful medium that resonates with speculative methodologies, supposing that practice both forms and transforms the one who practices (Kemmis, 2014)

> *I'm curious: how does my designing with others become part of a research process of shifting practice?*

A framework of relational interactions reveals how methods emerge in spaces of practice-led research. Within the practice space of this research project, data becomes conceived as a practice of knowing. That is, as the 'knots' of data emerge, a practice of speculation becomes integral to how I make sense of what that data means in the context of this study. In this way, data is a form of practice activation that flows with the creative inquiry.

My background in communication design (formerly graphic design, graphic arts, commercial art, printing, typesetter ...) forms a slippery continuum of practice convolutions. My practice is held by—and emerges with—the tensions that pulse within these ontologies. This slope of this disciplinary convolution forms a dislocated cartography—a map that forms as it's read—uncharted and bewildering. However, this research recognises that rather than generating and delivering an instructive 'map of practice', methodological inquiry looks to explore strategies that permit this disorientation of practice contingency as a process of learning.

> *My design practice led to design teaching through further qualifications in education. Expanding my disciplinary boundaries led to a bewildering and entangled interdisciplinarity. This research draws on antecedent practices that make up my ways of knowing as a designer—drawing from the interiority of this practice—toward immanent sensibilities of becoming through research. I'm looking to name the form of this shifting practice—the formlessness feels vertiginous. I can sense how this emerging practice looks to find form in the spaces it moves into and becomes ...*

1.2.3 Ontological Entanglements

In order to allow the emergence of *connections* within this research ecology, this doctoral study is framed as an *entanglement*, anticipating how encounters with theoretical perspectives contain ontological shifts for design. This approach invites the possibilities, through the joining of practices, for multiple accounts of being (and in turn becoming). It promotes a problematic, albeit inclusive, frame of inquiry. Does design shape things in the world in the same way that epistemology shapes things in the realm of knowledge (Murphy 2017)? If research advances our knowledge of the world, how might we consider this against how design becomes a mode of inquiry? What knowledge does design produce and how? These complex questions have ontological implications.

Ontology is the study of being that is concerned with 'what is' — with the nature of existence and the structure of reality (Crotty 2020, p.10). Ontological issues emerge alongside epistemological issues. In many cases, it would be better to retain the use of the term 'theoretical perspective' and reserve the term 'ontology' for those occasions when we exclusively need to discuss 'being' (Crotty 2020, p. 11). However, this doctoral research looks to make meaning out of design as a way of being in the world.

Design is ontological in that all design-led objects, tools, and even services bring about particular ways of being, knowing and doing. Arturo Escobar (2018) posits radical independence and autonomy for the making of worlds through design. An ontological designing might come to play a constructive role in transforming entrenched ways of being and doing toward philosophies of well-being that finally equip humans to live in mutually enhancing practices with each other and with the Earth (Escobar 2018).

Design is ontological because: "we encounter the deep question of design when we recognise that in designing tools we are designing ways of being" (Winograd and Flores 1986, p. xi, in Escobar 2018, p. 110). If we take design to be an interaction between understanding and creation, design is ontological because it is a conversation about possibilities. The more significant and more complex implication here is how we address this dimension of design as having the capacity to address how society engineers inventions whose existence in turn alters that society. The idea of an ontological design is derived from the work of Winograd and Flores (1986) who summarise the principles of ontological design as thus:

> The most important design is ontological. It constitutes an intervention in the background of our heritage, growing out of our already-existent ways of being in the world, and deeply affecting the kinds of beings that we are. In creating new artefacts, equipment, buildings, and organisational structures, it attempts to specify in advance how and where breakdowns will show up in our everyday practices and in the tools we use, opening up new spaces in which we can work and play. Ontologically oriented design is therefore necessarily both reflective and political, looking back to the traditions that have formed us but also forward to as-yet-uncreated transformation of our lives together. Through the emergence of

> new tools, we come to a changing awareness of human nature and human action, which in turn leads to new technological development. The designing process is part of this "dance" in which our structure of possibilities is generated" (1986, p. 163)

And, crucially, that:

> "In ontological designing, we are doing more than asking what can be built. We are engaging in a philosophical discourse about the self—about what we can do and what can be. Tools are fundamental to action, and through our actions we generate the world. The transformation we are concerned with is not a technical one, but a continuing evolution of how we understand our surroundings and ourselves—of how we continue becoming the beings we are" (1986, 179).

According to Escobar, every tool is ontological in the sense that it establishes a set of rituals and ways of doing, models of being (Escobar 1995). From a much broader perspective, these designs contribute to shaping what it is to be human—we design tools, and these tools design us (Escobar 2018). Escobar conceives of design as ontological through a weaving together of theories that put forward a constructivist epistemology; we are not separate from the world, but rather we create the phenomenal domains within which we act; and that this world is created through language. This thesis follows Escobar in recognising how constructing ontologies is practice-orientated—the sensing of disharmony in one's world is addressed by eschewing abstract theory for intense engagement and involved experimentation. Active exploration resonates with designs' propensity for engaged experimentation through prototyping or imagining future worlds through playful speculation.

1.2.4 In-Between: a Theory of Lines

Critical to methods of 'joining' is Ingold's conception of a 'line' and how it speaks to, and through, method. This section outlines how I develop Ingold's 'Life of Lines' (2015) as a significant theoretical framing.

By way of explanation, Ingold begins by describing what a line is not—that is, a 'blob'. Blobs have insides and outsides—they expand and contract—they take up space, and they can even meld into each other. But what blobs cannot do, is to cling to each other without losing their own particular identity. According to Ingold, a world of blobs can therefore have no social life, and if we take all life to be social, in a world of blobs there can be no life at all—that is the world of the line.

A 'life of lines' is described by Ingold as a state of *entanglement*. When everything tangles with everything else, when all is entangled, the result is what Ingold calls a meshwork. A meshwork is a collection or a bundle of lines. The line brings the social back to life as it accounts for the movement between blobs. Lines are described as a 'composition' (Ingold 2015, p. 3). Lines, in the meshwork of this research, are life-giving compositions that create meaning through 'knots'.

For Ingold, a meshwork is full of joins he describes as knots, and I ask, with Ingold, what does it mean to join? The notion of joining explored through the concept of a knot isn't to be mistaken for the kind of 'joints' we find side by side or end-to-end like a chain. The inherent rigidity of these joints means interiors cannot mix or mingle—such as the 'articulation' of carriages of a train linked end to end. Ingold suggests a chain has no memory and when separated it simply falls to the ground, unaffected. A knot, on the other hand, retains an impression of its former state. It curls back into a memory of its joined state. This memory is baked into the material—it's in its very fibres. An articulated structure like a chain remembers nothing because it has nothing to forget. But the knot remembers everything and has everything to forget—untying a knot reveals memories of former associations that are present in its material presentation. Joining with a knot requires the things joined to be flexible. They do not just meet on the outside; they meet in the *interiority* of the knot. This is different to end-to-end joining, this is joining in the middle.

It is in this way knots are *in the midst of* things. Their ends are looking for an entanglement. The flexible knots and articulated joints are, therefore, contrasting ideas. A carpenter makes joints, whereas knots are closer to basketry—weaving pliable materials rather than solid wood. With a basket, it's the "countervailing tensile, and

compressive forces of bent withies lend rigidity to the whole structure" (p. 22). Ingold's conceptual exploration alludes to what it means to make things. Both carpentry and basketry have *making* in common. Both use different kinds of joining. " The necessity of the knot is not a brittle one ... but a supple necessity that admits to movement as both its condition and its consequence" (p. 23). This necessity comes from commitment and attention to materials and listening to the "ways they want to go" (ibid.).

Ingold re-considers the carpenters joint as more knot than articulated joint because of the way materials offer themselves to one another on the inside without losing the identity of a whole—a composition of materials that retains the individual identity of the parts. The carpenter's joints interpenetrate making an enduring condition of interiority at the joint. The joint then becomes an enduring condition like a knot which has a condition that lives on beyond the joining. These joints, according to Ingold, are relationships not of articulation but sympathy. "The parts possess an inner feel for one another and are not simply linked by connections of exteriority" (p. 23).

Supposing practice to mean the making of ontological realities (Stengers and Annemarie Mol, 2002, in Michaels, 2018) we might conceive of 'making' as an opening-up of ways of knowing between existing bodies of knowledge. I appreciate this idea alongside Ingold's (2015) distinction *between* and *in-between*. For Ingold, 'between' articulates a joint—again—the articulation of a divided world. 'In-between' on the other hand, is a movement of becoming without a final destination. 'Between' has two terminals, whereas 'in-between' has none (p. 147). A movement in the 'between' state is from 'here to there'—toward a final state whereas 'in-between' is an ongoing condition. It is the 'in-between' that is the realm of the life of lines—not joining up, joining with.

This research is framed in the 'in-between', and develops conditions for 'in-between-ness', building knowledge along the paths that continually unfold (p. 148). Inhabiting the in-between locates the space of knots, where collaboration becomes possible through intentional research. It is in-between the human and non-human acting on the research puzzle we 'see' the interconnected habitat of design's relationship to the social imagination of things and practices. We reveal design's capacity for imaginative connections through practice.

1.2.5 Theories of Practice

The following section outlines practice theory as significant to how this research is framed as 'practice-led'. This section analyses conceptual frameworks associated with practice, including models that appreciate the role of practice within this study.

A so-called 'practice turn' was conceived in the social sciences around the time of Donald Schön's study, 'The Reflective Practitioner: How Professionals Think in Action' (1983). Schön's work is a significant inquiry into the practical and experiential knowledge of designing. The 'Reflective Practitioner' teases out concepts of the tacit knowing and implicit knowing of practitioners that surface in action and doing, rather than words. Schön's work is consistent with Theodore Schatzki, who edited 'The Practice Turn in Contemporary Theory' (2001) with Karin Knorr Cetina and Eike von Savigny. Schatzki describes a common interest: "Practice theorists conceive of practices as embodied, materially mediated arrays of human activity centrally organised around shared practical understanding" (Schatzki, T., 2001, in Joost, et al. 2016, p.36). Consistent with this research, practice theory appreciates the practices themselves as central to the production of meaning. According to Andreas Reckwitz: "A practice is thus a routinised way in which bodies are moved, objects are handled, subjects are treated, things are described, and the world is understood" (Reckwitz 2002, p. 250).

The 'practice turn' in the social sciences identifies the field of practices and the significance for social and cultural creation of meaning (Mareis 2016, p.40). Locating a co-design practice within this research has signalled a move away from artefact or object toward an open-ended set of actions or processes—toward the sense of practice emerging. This doctoral study aligns with Claudia Mareis (2016) who promotes design practice research as evolving new languages and definitions of research methods and actors alongside "a distinct discourse of the praxeological" (Mareis 2016, p.35). Design research looks to the reciprocity of practice and theory construction, seeking new ways of understanding how practice research produces knowledge (ibid.).

Immanent Practice

According to Phillips (2018), practice is a kind of rehearsal. *Work* is the expectation of remuneration, compared to *practice* that has no such 'discrete expectations' (p. 72). In our practices we have a heightened appreciation for our participation in the flow of the process (ibid). It is through this flow we develop the improvisation that is key to the practice state of productivity. The practice of designing can, therefore, be distinguished from the work of a designer—to be a practising designer is to be embedded in the immanence of creative flow. It is to be reflexive—and this renders the practitioner with a capacity to be more active (or perhaps less reactive). Practice outcomes, in this sense, do not necessarily summarise this process, but they do present an embodiment of the states of flow. It is in this way that practice can communicate different ways of being in, and coming into, the world (Phillips 2018).

Practice is imbued with a sense of the active—an active relationship with the realities we inhabit (Althusser 2018, p. 44). This is an activity of formation; both the formation of the practice and the forming of the practitioner. If we take practice to imply the notion of active contact with the real, there is an implication of active agents (either human or non-human). Practice designates people's active contact with the real, making all practice social: "We shall therefore use the world practice to designate a social process that puts agents into active contact with the real and produces results of social utility" (Althusser 2018, p. 45).

Every practice is deeply social and surfaces a complex set of elements and agents (Althusser 2018). We can conceive of social practices not as simple acts or activities but as processes. Joining Althusser, I engage with a definition of practice that designates a social process that 'puts agents into active contact with real results of social utility" (ibid). And that the way we engage with and visualise the determination of practice is itself part of an immanent practice of becoming.

Mapping Emerging Practice

Professional learning in design research results from the designer becoming part of the research process (Findeli 2001). Learning through research is "a distinctively unique, situated and bounded problem space that includes a variety of actors and human and non-human factors and relations" (Shumack 2015, p. 236). Learning in this context is a complex and emergent process of discovery—the situated nature of iterative designing takes on a significant role in guiding and shaping the research outcomes (Lawson, 2006, in Shumack 2015). New approaches to interdisciplinary research surface new practices, and there is value in the potential to develop autonomous and accountable research outcomes (Lury 2018) from within those practice habitats.

In this study, practice is mapped though modes of emergent making and iterating. This mode is conceived of as a mapping process, a practice that can focus attention on alternate possibilities and potentials of the situated research through designerly ways of knowing (Cross 2006). The emergence of this type of approach enables the design researcher to engage with a multiplicity of data forms in dynamic and speculative ways (Shumack 2015), drawing attention to what is not known and what may emerge.

A mapping practice is analogous to the data sense-making process, where data produced in the documentation of the teacher workshops is re-mapped through creative mark making to develop methods of sense-making. In joining the teacher-participants, I refer to the process as 'context mapping' (Visse et al. 2005), aiming to create a range of perspectives from a collective of expertise. Experiential inputs from participants contribute to the shape of the design outcome, thus, "creating new domains of collective creativity" (Sanders and Stappers 2014, p. 5) in which participants bring an emergent and embodied knowing, alongside practical perspectives, that inform the design research context.

Noticing Practice

'Joining' is adjactent to a practice of 'noticing'. John Mason's thesis 'A Discipline of Noticing' (2002) expands on Donald Schon's (1983) valorisation of 'reflective practice'. Mason expands Schons' deployment of the terms 'reflection-on-action' and 'reflection-in-action'. 'Reflection-in-action' identifies the work of designers and might take the form of diagraming to externalise relationships or ideas common in design practice. Mason adds

'reflection-through-action' (Mason 2002, p. 15) where a practitioner becomes aware of the practice through the act of engaging in that practice. It is this particulat mode of reflection that is significant for the methodological inquiry of this doctoral study.

Research with teacher-practitioners led to questioning how teachers might reflect through their practice. However, a more significant question for this study is how designing might engage with reflective practice. This question takes into account how reflection includes a process of attention that flows outward toward broader socio-cultural forces, and how these forces press upon the practitioner to act, work or speak in particular ways (Mason 2002, p.16). This flow or mode of reflection works toward our internal or external realities that are located at different levels. Mason refers to this as a 'scope of reflection' (ibid.) and indicates how reflection contains many possibilities. Scoping can be understood through the analogue of learning. Following instructions and completing tasks might give the learner a sense of engaging in or completing learning; however, this does not necessarily ensure learning has actually taken place. A student needs to *participate* in the activation of learning for it to be meaningful. The same is true for reflection, as a practitioner must activate the learning from within the scope of their practice expertise. This research corralls Masons' 'noticing' alongside the method of 'joining', framing how we might activate the 'disorientation' provoking transformative learning. A practice-led design researcher creates the scope of reflection that, in turn, determines deeper learning about that practice.

Layering Practice

Conceiving of reflective practice as a set of layers contains the variety and context of reflectiona and improves how we appreciate the scope of practice (MacIntyre 1993, in Mason 2002). MacIntyre (1993) describes these layers as:

- First, a technical level of setting professional goals in establishing management or assessment frameworks—specific practical goals. This is closer to the work of professional development;
- The second level concerns more complex concerns of assumptions, predispositions, values, and consequences which connect with our actions. This places the practical issues or goals in a wider context and interrogates the hissed assumptions etc.;
- The third level is much more critical—even emancipatory. It concerns broader ethical or social issues and how the individual practice is situated within those issues. Crucially, this level critically inquires into the institutional or social forces which might be constraining the individual's freedom of action and in turn, might limit the agency of those individuals and their stories. It essentially questions how institutions come to exert their influence—where those institutionalised practices originate and the powers behind them.

This kind of layering orientates a movement outwards from individual practice to broader structures of social forces—it is a social-reflection. Conceptualising the 'knot' within the methodological inquiry takes into consideration how the 'layers' of the knot correspond to MacIntyre's model, and how the knot aims to shift practice toward situating design within broader social settings.

Mason's (2002) noticing, on the other hand, is more psychological-reflection as it starts with the same first level but instead moves *inwardly*. According to Mason (2002, p. 17) it is an act of sensitising oneself to notice situations where alternative actions are possible, and making changes to your practices through those choices to act differently. This sensitivity equips a practice with the capacity to identify and in turn question underlying assumptions and values that inform the scope of reflection. A scope of reflection requires a field of visible qualities, both internal and external, and a practitioner's capacity to see and experience the site of practice—a practice of witnessing.

Witnessing Practice

According to Mason (2002), practice involves developing an 'inner witness'. The inner witness 'watches' without getting involved or stuck in the participation—detachment can be a refuge for the practitioner (Mason

2002, p.19). This discipline helps the practitioner to 'see' the activity in front of them and can surface implicit assumptions and can work to develop a distinction between the actor and observer. As Schon reminds us; reflective practice requires a kind of 'living in' and not just occasional attendance (Schon 1987, p. 311). It leads to the question: how might we 'live in' our practice in ways that encourage learning from experience and enabling that experience to inform practice?

To develop 'inhabiting' practice is to foster the epistemic beliefs of a practicing researcher appreciating the value of deepening practice knowledge. Shifting values requires an expansion of world-views which positions what it means to know, and how we can validate new ways of knowing. This 'knowing' primarily comes about through our experience of language. A social-constructivist stance would describe this unfolding as occurring through our engagement with and immersion in the language (Burr 2003). It follows that our perceptions are limited by the language that allows us to perceive; this includes the experience, and participation in, the actions of sense-making—making the sensate intelligible. Making our worlds intelligible is driven through how we join our past experiences with the present. To 'see', and to 'make sense' of what is unfolding in practice requires a capacity to be present. It is an act of attention, the giving of attention to the present moment and the development of the unfolding events (see 3.3.3).

Mason's 'Discipline of Noticing' is a call to broaden the scope of our reflection to articulate our practices, noticing the potential of ourselves as practitioners-in-action. To witness an extension of the present moment, Mason posits this discipline as key to informing future actions—a sensible approach to pursuing practices that inhabit sites of research through creative methodologies.

1.2.6 Shaping Relationships

This research recognises that a 'social turn' has shifted how we imagine, position and evaluate the dialogic nature of design practice. This re-evaluation prompts an ethical turn in how we critique the efficacy of the social practices that design seeks to inhabit. Methods developed in this study recognise the 'dialogic' in design locates an understanding of how design has shifted from material outcomes towards discursive exchange (Bishop 2006). A 'social turn' also indicates that design has been shifting toward community-based social practices that are relational and situated. Co-design practice might be evaluated by the qualities that design brings for communities building a capacity to create new relations between people, places and objects. A co-design practice seeks to develop these relationships in response to a specific and situated problem space.

> *Perhaps it's in the quality of the relational practice space that co-design inhabits that we find a 'proof' that speaks to its efficacy.*

Despite the conceptual obfuscation of 'co-design' there is a consistent epistemic belief in how collective creativity can empower a community through collaborative action—sharing ideas, and sense-making—coming together and making changes from within rather than without (ibid.).

A co-design practice engaging with communities through creative participation must allow agency to emerge through *consensual* collaboration. Consensual emergence might be best understood in how we situate ourselves as practitioners from within collaboration. It is problematic for co-design to force or contrive collaboration that frames agency as a product of collaboration, presupposing the communities capacity to effect change from within their practice (ibid). This research examines how we might *make* methods that create a lasting installment of agency from within a community, acknowledging the relational as key to understanding co-designs impact.

Shaping Relationships through the Project (Making Space)

As the shape of 'Making Space' emerged, so too did the shape of my relationship with the ILETC program. At the outset of the ILETC, a practice of design thinking was installed to generate creative and collaborative experiences for teacher-participants, in turn informing an initial set of ideas to help guide the ILETC establish a research path. In this way, design thinking was servicing the ILETC program and became subsumed by the research intent that framed the ILETC. As a practice of co-designing unfolded, questions surfaced that informed my research: how do I position my practice in relation to this interdisciplinary program as research?

> *As the data began to form, I began to look at these outcomes through potential modes of designerly analysis. I began to appreciate that data generated might be examined through a process that emanates the material engagement of the co-creation that generated it. This helped me position my relationship with the data through design, a move that embodied a new sense of purpose.*

> *I approach data with the purpose of positioning my designerly expertise in relation to research. This didn't feel possible during early ILETC collaborations, where data was read through the framing of the program's methodologies. As the program progressed, my own research framing emerged: in what way is designing (practice) a positioning agent for the design researcher? And: how might this signal becoming a researcher through doing (practice-led research)?*

> *I feel this exquisite disorientation as a jolt of recognition—my practice has always informed my relationship with the world. The is the positionality a designer creates in relation to the designed. It describes the relational rather than the relationship. And the relational is a state of becoming. This is a state of continuous emergence, and it's a state, I argue, that design practice doesn't yet know how to know.*

Situating Relationships through Lived Experience

Developing an analytical framework adapted from Participant Observation (Schensul et al., 1999) situates how I join participants and data in this research puzzle. This approach aligns with thinking on how we frame both the design and the design practice as a way of inquiring into the design process and draws attention to how narrative flows in the design process (Lloyd & Oak 2018, Dorst 2015, Paton, B., & Dorst, K. 2011).

Collaborative workshops central to this research inquiry permitted a 'making-up' of stories to 'make-real' the lived experience of teacher-participants (Grocott, L. and Sosa, R., in Oliver 2018). I followed participant co-researchers joining this process of creating narratives through this sense-making process of story-making and telling. Stories led the research toward a better understanding of the qualities of emergent meaning-making inherent to designing.

> *Initially, data generated through these workshops came to be understood through a kind of fictional interaction using a language designed to generate meaning. It was born out of the insecurity that as a designer, I didn't have the conceptual apparatus required to make sense of the material I was generating with the research participants. I was faking it. It occurred to me that rather than deny this infiltration of 'imposter syndrome', it might be more productive to embrace it. Through fiction, I find my research reality.*

As I adapt the concept of joining my facilitation of co-creative workshops develops through Ingold's 'joints'; connecting the lived experience of teachers through creative collaboration. The strategies of a co-design practice—imagining and creating a sense of futures—is manifest in this process. I set activities and co-design experiences that enhance the possibility of interaction between objects, technology, and people, and give participants permission to play with a story of the worlds in which they inhabit.

1.2.7 Disciplinary Shifts

This collaborative research is located within an interdisciplinary program. The relational nature of interdisciplinarity is a significant factor to understanding this research project, and attendant concepts associated with this study—how design practice is shifting from within collaborative research contexts.

In this research design methods are characterised by a collaboration across and between methodological approaches. According to Lury (2018), the value of this kind of interdisciplinary approach to research is in the potential to develop autonomy and accountability of the research outcomes. This practice-led research appreciates that design draws on knowledge from diverse areas. Design is not just a knowledge-intensive activity; it is also a purposeful, social and cognitive activity that is engaged in a dynamic context aimed at changing existing circumstances into preferred ones (Simon 1996, Pahl and Beitz 2007). Design inhabits the possibility of co-evolving with other methodologies. This research posits that in order to move toward this expansion in the research landscape, designers need to articulate the nature of their sense-making expertise.

The invitation to join an interdisciplinary research effort invited the possibility to improve the quality of design practice knowledge by engaging with concepts, tools etc. from other disciplines. However, the experimental nature of this research leads to more of a critical interdisciplinarity—interrogating the research question and developing theory—that aims for a transformation of the discipline (Klein 2015, p18). This study argues that this is consistent with a 'transformative learning' paradigm of disoriented practice.

In turn, the interdisciplinary nature of ILETC research presented a potential to make a transdisciplinary knowledge—to shift design-led research toward crafting transformative paradigms of practice. In this study, the notion of the transformative design indicates a turning away from a design approach which gives focus to products or services. This is an extension of the human-centred approach looking toward a society-centred attitude and explicitly focuses on the social dimensions and conditions of designing (Jonas et al 2016, p.9). Design for social transformation engages a process of creative inquiry into new potentialities that can be designed and realised in new forms: organisational, cultural, system or collaborative education. What are design's potentials, instruments, and contributions to shaping social change? (Ibid.).

What are the important factors allowing this transformation to occur? This reappraisal of designing is indicative of how the shape of design has shifted with the changing nature of how it is practised (Jonas et al. 2016). As design research asks questions about how materiality develops as a learned social process, it, in turn, investigates how designing shapes social relations and cultural knowledge (Rogers & Yee, 2015). American polymath Herbert Simon's oft-quoted definition of designing as "turning existing situations into preferred ones" (Simon 1996, p. 111) points to the situation rather than the material outcome (product or thing) and his observation was a historical moment when designing became about planning and optimising—a fundamental aspect of practice and human endeavour. In short, he implied: everybody designs (Mazini 2015).

The implications of this shift have been many and varied. Instead of acquiring specialised expertise, designers have simply had to adapt to these broadening contexts (Joost et al. 2016). The scope of what designers are expected to do has necessarily changed in order to tackle issues that had formerly been out of the purview of the discipline; "we are leaving the operational framework traditionally assigned to design and starting to generate and use skills that enable us to operate much more broadly than before" (ibid., p. 136). There have always been debates about what design contributes, how it operates, it's limits etc., however, this is a fundamental shift from designer as a problem solver or a creative that crafts material outcomes, to an understanding that places values on the transformation we crave, and the stabilisation of social systems (Joost et al. 2016). Creative inquiry, expertly facilitated, has the potential to make known a broad expression of understanding.

1.3 Joining the Practice

Chapter 1.3 outlines in what way designing, co-design, and other practice(s) are central to this practice-led study. This chapter clarifies terms like 'designerly' and 'speculative' through a reading of ideas and practices in attendant literature. What design practice looks like, in terms of how it manifests within this study, will be given attention through an explanation of project grounded research as a framework that contains this study. Furthermore, how practice is corralled through speculative mode is a focus, alongside notions of 'sense-making', and what it means to have an 'experimental' practice within a collaborative research project.

1.3.1 Design

Designing with Uncertainty

This research, led through a co-design practice, appreciates that design has shifted toward being a medium that activates a 'social' rather than 'solution-making' expertise in the service of industry (Escobar 2018, p.34). The ongoing and broad promotion of co-designing by various sectors in the community indicates how design is shifting from acting as a service provider toward being a medium through which we can express and practice social ideas (ibid). This presents uncertainty around how we might conceptualise these emerging design practices.

Uncertainty and Possibility (Pink, Akama, and Sumartojo 2018) approaches and develops collaborative design interventions that explore the practical or conceptual idea of 'uncertainty' as a deliberate design intervention. The authors cite the work of Halse and Boffi (Smith 2016) who regard design interventions as an opening up of 'dialogues about possibility' and relate to 'peoples concerns, aspirations and imaginative horizons' (p. 101 in Akama et al. 2017, p. 9). This design practice intervention regards the 'technology' of uncertainty—a process of emergence that might lead to a collective sharing of possibility (Akama et al. 2017, p. 128). Emergence is central to this codesign work that looks at the outcomes of this project-grounded designing as an ongoing process of interpretation of meaning and practice over time and through collective imagination (p.129). This example of codesign practice aligns with research undertaken as part of this study of 'joining practice research' as the outcomes of the project within this study is an evolving conversation with the nature of practice-led research itself, in particular, the shifting relationship the practitioner has with design, shaped through practice-based research.

Ingold (2011, in Willis 2019) describes the practitioner as a kind of 'wanderer' (p.64), searching for the 'grain of the world's becoming and shaping the form of their evolving practice to its unfolding purpose (ibid.). Research through designing has shifted focus from objects towards the social; design has seen an evolving 'dematerialising'. However, it is not yet clear where this idea of the social is located (Kimbell 2009).

> "Design must have its own inner coherence, in the ways that science and the humanities do, if it is to be established in comparable intellectual and educational terms. But the world of design has been badly served by its intellectual leaders, who have failed to develop their subject in its own terms" (Cross, 2006, p.6).

This research responds to this persistent critique of Nigel Cross (2006), continuing this work of locating an 'inner coherence' so vital in developing the terms we use to describe what design does.

Participatory Design

The Participatory Design (PD) movement started from the standpoint that those most affected by design should have some agency in the design process. In 'Design Things and Design Thinking: Contemporary Participatory Design Challenges' (2012), Erling Björgvinsson, Pelle Ehn and Per-Anders Hillgren contend that

design thinking has become a central issue in contemporary design discourse and rhetoric. PD promotes the involvement of non-designers to make designing more sustainable. The movement has had a lasting effect on how design is practised (Mareis 2016). It has contributed significantly to the increasing emphasis on designing for strategy, social innovation, or policy; and this has prompted design to take on new roles supported by the idea that design can play a vital role in making more sustainable and inclusive societies.

Designs social context highlights design-based practices towards collective ends, rather than predominantly commercial or consumer-oriented objectives (Armstrong et al. 2014: 6). A PD process involves different actors and stakeholders working towards outcomes that are not necessarily solution-driven but rather become processual. This work contributes to the quality or shape of the problem space instead of dealing with concrete solutions (Joost et al. 2016, p. 136). A focus on process has evolved design toward services, processes, networks of humans, as the framework for action. In this sense, the notion of innovation becomes much more democratic (Ehn et al.) and has heralded a change in what we consider to be 'innovation' (or even 'design'). It has profoundly affected the way we practice design. Björgvinsson et al. (2012) state that; "... a fundamental challenge for designers and the design community is to move from designing "things" (objects) to designing Things (socio-material assemblies)" (Björgvinsson et al. 2012, p.102). This shift to 'Things' as social-material assemblies is situated in this research in how the study appreciates co-design as a practice of learning—a social assemblage.

Design Thinking

Carrying on PD's provocation, a promotion of 'Design Thinking' has rapidly appeared alongside a profusion of 'co-creative' encounters, leading to a conceptual obfuscation (Tuckwell 2017). The ILETC locates the 'design thinking' within the program research agenda to communicate an innovative approach to establishing a research program that engages creative collaboration with participants. Terms like 'innovation' and 'design thinking' that have grown in popularity as a language that moves from problem-solving to broader or more inclusive definitions of creative practice. It broadens the promise and potential nature of 'designing', and it's evidenced in emerging modes of processual design practices. However, clarification is required as 'design thinking' persists on becoming a collaborative practice of creative agency.

The design process is formed through a curious logic that cannot be adequately equated with science or engineering. Science typically focuses on perceiving or revealing 'facts' whereas design concerns itself with seeing or realising alternatives that incorporate imagined values. Imagining alternatives is understood as a process of abduction which refers to a kind of reasoning that is different from deduction or induction."Deduction proves that something must be; Induction shows that something is operative; Abduction merely suggests that something may be." (Peirce, C.S., 1903, p. 314). In abductive processes, a designer might start by outlining or experiencing the specifics of the problem whilst simultaneously and perhaps literally imagining ways to approach and frame the situation. Some would argue that abduction is at the very core of design thinking (Dorst, 2011). Abductive thinking is associated with the ways designing iteratively develops problem frames or combinations of results whilst developing potential solutions.

Design thinking, however, remains an evolving construct (Martin, 2009). It is considered to be "a discipline that uses the designer's sensibility and methods to match people's needs with what is technologically feasible (Brown, 2008). According to Plattner, Meinel, and Leifer (2015), design thinking involves a human-centred process, works with ambiguity and makes ideas tangible. Design thinking has antecedence in the work of designer Bryan Lawson, who outlines in How Designers Think (1990) an inchoate understanding of thinking associated with design—a prototype of design thinking. Lawson reveals that much of the literature on cognition had, then, a variety of closely related binary divisions between rational and logical processes on the one hand, and intuitive and imaginative processes on the other. Lawson recognises that these two major categories have become known as convergent and divergent production. The convergent task required deductive and interpolative skills to arrive at one identifiably correct answer. Divergent ability, on the other hand, engages an open-ended approach which seeks alternatives where there is no determinate answer. Lawson notes that designing is mostly taken to be a divergent task since, according to the proceeding logic, design rarely leads to one 'correct' answer. However, designing involves both convergent and divergent productive thinking, making it challenging to define.

Before Lawson, J. Christopher Jones alludes to 'design thinking' in his seminal text 'Design Methods' (1970). Jones outlines 'The Design Process Disintegrated' noting that design is a three-stage process that involves divergence, transformation, then convergence. Jones notes that:

> "... The thinking that designers are accustomed to keeping to themselves has now been externalised so that people (including users), whose knowledge is relevant to designing at the systems level, can put forward their ideas at an early stage and can share in the taking of critical decisions" (Jones 1970, p61).

Jones believed in the importance of explaining the design process so that design cognition can be known and shared with the society it serves.

Designerly Thinking

An alternative way to approach 'design thinking' is as 'designerly' ways of knowing (Cross, 2006; Kimbell, 2009). Designerly ways of knowing are embedded in practice, in the making and doing that is part of the design process. As alluded to in 'Designerly Ways of Knowing' (Cross 2006), designers have the ability both to 'read' and 'write' in their world of 'stuff'; that is, they understand what messages objects communicate, and they can create new objects which embody new messages. A capacity to read and write through design is taken into consideration within the interdisciplinary research program that situates this practice-led study. That is, research engaged participants through designing, not only as an instrument or method, but as a response to the broader demands of practice transformation (Barry, Born, & Weszkalnys, 2008).

The strategies of design thinking are fast becoming synonymous with approaches to the sort of generative collaboration that engages creative intelligence (Dorst, 2015). This type of creative work is increasingly recognised as an effective driver of innovation, tackling complex 'wicked problems'—the types of messy, aggressive, and confounding problems that are ill-defined in cause, character and solution (Rittel & Webber, 1973). Arising from these efforts a practice of co-design has become more defined, emerging as a set of strategies that can put designing into collaborative modes of action. In co-design practices, participants engage, explore and perform evolving practices in their active meshwork of practices. This rehearsal occurs through prototyping new configurations of people and things (Halse 2010), shifting the focus of design toward relations and practices and the networked ground of interwoven knowledge and agency (Vaughan 2017, p. 107).

Co-design builds on traditions of PD and participatory social processes that allocate a collective appreciation of design's purpose and value. It's in this sense that all design might be a type of co-design because all design engages with social processes (Steen 2013). I'm adapting Steen's (2013) use of 'co-design' which has been derived from Sanders and Sappers use of the term: "collective creativity as it is applied across the whole span of a design process"(Sanders & Stappers, 2008, p.5-18).

'Designerly' Practice Frame

This research project looks to examine practice by reframing how we name design 'problems'. According to Schön (1983) the 'problem setting' is the process in which we name the things to which we will attend and frame the context in which we will attend to them. In other words, designers work in differing modes: selecting aspects of the problem space to which they direct their attention (naming) and then identify areas of the solution space that they choose to explore (framing). To formulate a design problem to be solved, the designer must frame a problematic design situation: set its boundaries, select particular things and relations for attention, and impose on the situation a coherence that guides subsequent moves (Schön 1983).

The notion of a 'designerly' mode of inquiry emphasises the importance of practice in knowledge generation (Cross 1982). The importance of practice was valued by John Dewey (1859-1952) who argued that separating thinking from acting is obsolete and that thinking depends on real-life situations (Dewey, 1968). Dewey influenced the work of Cross (2006), who translates his arguments by way of Schön (1930-1997). Schön's (1983) description of the individuals' professional practice, focuses on the work by practitioners during their 'reflection-in-action' as they attempt to reframe problems, based on reflexive judgment. Cross (2006) extends

this to outline research attempts to describe the thought processes of designers in action: their designerly way of knowing (Cross 2006) or design thinking (Rowe 1987).

Design is a systematic search for and acquisition of knowledge related to general human ecology considered from a "designerly way of thinking" (i.e. project-oriented) perspective (Findeli 2008). 'Designerly Ways of Knowing' (Cross 2006) has become an epistemological positioning for design. That is, design, understood through this epistemic lens, is crucial to the rigour of design research that traverses different domains of knowledge (Jonas, 2014).

Design Epistemology

In design research, epistemology is partly revealed through the choices that researchers make to inform the world that is being researched (Matthews & Brereton 2015). According to Scharmer and Kaufer (2000), most of the socially and economically relevant knowledge is built outside of the university, a critique that aligns with a designerly approaches to research where knowledge building is generated by non-traditional forms of qualitative research. Design research, in this way, is situated in practice ecologies. A practice-led, non-traditional approach acknowledges that we face increasingly complex problems as a society, and that research must continue to renew its epistemic core. For design practice-led research, this examines the nature of sense-making as a practice of knowledge generation.

1.3.2 Making-Sense

Abductive Thinking

In a co-design approach, problems, and the frame of problems, are explored, developed and evaluated in a parallel and iterative sense-making process (Kurtz and Snowden, 2003). Sense-making is an action-oriented process that we engage with in order to integrate experiences into an understanding of the world around us (Kolko 2010 "Abductive Thinking and Sensemaking: The Drivers of Design Synthesis"). Designer Jon Kolko refers to sense-making as the synthesising of designerly breakthroughs—the synthesis of ideas through design (ibid.). Sense-making challenges the assumptions of rational intent often prevalent in categorising organisational frameworks like that of the ILETC program. In a sense-making framework, data precedes the framework—it emerges from the data. Sense-making resists a categorisation model in which the framework precedes the data. In this research design, the former framework of sense-making is enrolled as a fundamental approach to a designerly modes of inquiry.

As discussed, abductive reasoning—the logic of what might be—is present in how I 'attune' or join the data. Abduction is not a direct reading that evidences what is; instead, it's a designerly reading of the phenomena that conjures an impression of what might be. In the case of the ILETC, the teachers leave evidence of practice alongside an impression of practice as they engage with co-creation—and put into practice their realisations that occur in these conversations. Abductive thinking, in this context, is a meta-process for analysing integrative creative practices.

Abductive thinking is regarded as a meta-methodological approach. There is a growing interest in the social sciences for foundational meta-practices that can integrate knowledge (Teixeira de Melo 2018). Carefully crafted abductive reasoning can amplify collaborative methods in creative and generative ways. In this sense, abductive reasoning is an inquisitive stance or mindset, characterised by openness, curiosity, exploration, humility and creativity (ibid, p. 91). To this end, abductive reasoning can initiate a research cycle, creating a foundation for the role of deductive or inductive inquiry, making it a meta-method (or meta-practice) for the enactment of complex practices. Abductive logic is the central mechanism of knowledge generation in our everyday life, as well as in design and science (Jonas, 2016). This has been conceptualised in Design Research through notions such as 'problems of organised complexity' (Weaver, 1948). Abductive logic is not a traditional or classical means of processing research, but a relatively new method (Reichertz 2010). Carefully crafted abductive reasoning can amplify collaborative methods in creative and generative ways. It is an inquisitive stance or mindset, characterised by openness, curiosity, exploration, humility and creativity (ibid 91).

Teixeira de Melo and colleagues look at the use of abductive reasoning in interdisciplinary focused research where there is a cultivation of open mind frames and a growing expansion of each field through dynamic interactions (Teixeira de Melo 2018, p. 91). According to Kolko, common to these types of dynamic interactions is a "sense of getting it out" to see and form connections (Kolko 2010, "Sensemaking and Framing: A Theoretical Reflection on Perspective in Design Synthesis"). He suggests that sense-making is an inward and personal process, while dynamic synthesis is a more collaborative, outward process. Making sense of data generated by designing, means finding relationships and patterns between data elements and drawing out an external view. As Kolko points out, it is less important to be "accurate" and more important to give some abstract and tangible form to the ideas, thoughts and reflections. When we have achieved this, externalising ideas seem more real and develops into something that can be discussed, embraced or rejected—ideas become part of a more extensive process of synthesis.

Making Sensate

In Doing Sensory Ethnography Sarah Pink (2009) posits that the work of the social scientist in the field as a learning process which is "embodied, emplaced, sensorial and empathetic, rather than occurring simply through a mix of participation and observation" (Pink 2009, p. 65). This, according to Pink, can lead to acute disorientation and that this sensory experience can give researchers access to a new form of knowing (ibid. 2009). In short, this disoriented and embodied form of knowing can be both jarring and revelatory.

The idea is taken up by Virginie Magnat (2016) as productive disorientation, a concept I use with Magnat in describing the work of the designer making sense of the mess of collaborative research practice. Magnat works as an ethnographer-apprentice who learns "to know as others know through embodied practice", whilst participating "in their worlds, on the terms of their embodied understandings" (Pink 2009, in Magnat 2016, p. 180). An embodied researcher performs possibilities (Denzin 1994) as revelations of agency and understating—to create practices that engage in the collaborative formation of meaning through experience. An 'experimental theatre' informs the 'promise of disorientation' (Magnat 2016) of Eugenio Barba. His performance practice announces the concept of disorientation as a technique through which the performer destabilised the body-mind balance and altered their perception of the world.

Disorientation as method led to the idea of de-conditioning design to dissolve daily behaviours, allowing a re-conditioning to occur. Barba suggests a kind of 'thinking-in-motion' that Magnat adapts as 'productive disorientation' (p. 181). Thinking-in-motion is an alternative to thinking in language or concepts. Thinking in motion is associated with what Barba considers "creative thought ... which proceeds by leaps, employing sudden disorientation which obliges it to reorganise itself in new ways" (Barba 1995, p. 88). This type of 'thinking' is what Sarah Pink refers to as a sensorial, empathetic way of knowing.

Collaborative Design

A conceptual expansion of designerly 'making' leads to entanglements of systems, processes, policies, and people (Grocott 2016). It is within this entanglement that design collaborates with ethnography, systems theory, psychology, etc. These entanglements situate sense-making and positions designerly expertise as a shared epistemology. Co-design invests in the epistemic belief of collective creativity as a collaborative inquiry. It is a practice of sharing designerly knowledge that brings people together to explore, make and bring about change. Steen (2013) argues that co-design is a process of collaborative thinking and joint inquiry where the imagination of a group of diverse people come together to explore and define a problem situation together, and in turn develop and evaluate solutions. It is a process in which participation is an expression of experience, and the discussions that stem from this participation helps to negotiate roles and interests and the mindsets of those participants.

This 'expression' can be understood as communication: "The heart of language is not 'expression' of something antecedent, much less expression of antecedent thought. It is communication; the establishment of cooperation in an activity in which there are partners, and in which the activity of each is modified and regulated by the partnership" (Dewey, 1962, p. 179). Dewey emphasised how people's ability and capacity to communicate is how we collectively bring about positive and desirable change. His work is curiously analogous to co-design

practices where people coming together to jointly explore and discuss problems, and work together to develop and evaluate possible solutions—something Dewey advocated in his work (Steen, 2013).

Dewey appreciates knowledge as instrumental—he proposed that knowledge must concern the exploration of alternative futures and knowledge must concern the promotion of cooperation and the organisation of positive and effective change. These ideas are found in co-design practice and become key themes in this research work, framed and evaluated through theories of practice and notions of becoming (ibid).

1.3.3 Designing as Speculative Inquiry

This research is orientated through speculative inquiry. Speculation in design has developed practices that engage creatively with the latent possibilities of the present, and works to experiment with methods and processes that enable the becoming of possible futures. Speculative Design has established a unique methodology from within the discipline as a field of speculative practices turning toward visioning technological and aesthetic propositions and outcomes (Dunne & Raby, 2013). A Speculative Design practice challenges the dominant paradigms of functionalist design with often radical propositions to act as a 'catalyst for social dreaming' (Dunne & Raby 2013. p. 189). However, Speculative Design practices have come under scrutiny for their propensity to inadvertently further the euro-centric 'futures' framework that they purport to critique (de Oliveira 2016). A more critical and diverse 'speculation' calls out a deeper understanding of how design might bring our lives into being—an ontological approach (Willis 2006). The focus of this research however is how speculative approaches in the social sciences might inform a critical speculative designing, and studies how this emerges from the practices within this doctoral research.

Preceding Speculative Design, social scientists have examined how communities engage in discursive practices, especially concerning technologies and how we build expectations associated with these developments (Brown, Rappert and Webster 2000, in Lury 2018: 347). Interdisciplinary research scholars have recently been interested in developing speculative research to examine how we understand, explain and theorise processes alongside notions of becoming (Lury 2018, p.348). Scholars such as Wilkie (2017) develop work from constructivist approaches through the work of Stengers (2008, 2015). In a constructivist mode, speculative thought becomes a practice of designing and constructing adequate concepts and 'devices' that actively 'relate knowledge production to the question it tries to answer' (Stengers 2008, p. 98, in Lury 2018), thus examining how the researcher researched. Research devices *become* with one another (Lury 2018, p. 348, my emphasis). This doctoral research develops with models of interdisciplinary and speculative research in the social science field to augment modes of 'becoming' that I engage in this doctoral study.

Speculative research promotes an experimental approach to research that actively involves an emergence of methods that emanate the situations of possibilities being studied (Lury 2018). This activation builds on the *ambiguous* as an expression of the experience of learning from research situations. Crucially, speculative research does not aim to validate methods of inquiry—it is a practice of evocation rather than evaluation. In this way, speculative research deviates from the 'pre-formatted geometry' (Wilkie et al. 2017, p. 25) of anticipating future scenarios. Instead, it focuses on building capacities that might enable us to pay greater attention to and experiment with processes of becoming. Speculative research, therefore, eschews methods that use statistical or algorithmic metrics to inform future thinking. Cultivating a sense of the possible concerns 'future thinking', however, speculative modes use methods that imagine the *impossible* through creative practices of invention. Cultivating this imagination can lure practices that extend our thinking, knowing, and feeling as we inquire into unforeseen possibilities. In this way, speculation acts as a unique cognitive capacity (Lury, 2018), a sensibility that resists predicting a future that is probable and focuses on seeking or realising the potential of the present—to imagine through a sense of becoming (ibid.).

Speculative research results from collective and collaborative thinking—a process of making possible in order to cultivate a speculative sensibility (Wilkie et al. p. 2017). Creating possibilities and experimenting with them is a collective and transdisciplinary practice. Isabelle Stengers (2015) states we must: 'Respond to the insistence of a possible that demands to be realised' (Wilkie 2017, p. 19). As a sense-making process, speculative

research actively seeks alternative questions and methods through an experimental and emergent mode. That is, speculative research is looking to re-situate concepts, "to relaunch them again as propositions capable not of poisoning the present but of cultivating a different kind of future" (Wilkie et al. 2017, p. 45).

In this study, I situate speculative practice by grounding it in the experimental projects embedded in the program. Furthermore, speculative methods deliberately provoke the object of the research. Becoming, in this sense, might be conceived of as a specific set of speculative interventions. Wilkie directs us toward a practical approach to more grounded speculative experimentation that seeks to broaden the composition of research through concepts and tools that "are themselves actively involved in the very construction of possibilities that emerge from these situations" (Wilkie 2018, p. 350). Speculative research is a process that is not always clear or transparent even to the practitioner who is also in the act of becoming.

1.3.4 Reclaiming 'Experiment'

The use of the term 'experimental' is widely and variously applied in contemporary research (Wilkie, Savransky, and Rosengarten 2017). For the purposes of this study, this section clarifies the term 'experiment', and the value of the experimental, is a reclamation of the word for sites of speculative research (ibid). In this way, I use the term 'experiment' with researchers seeking to learn what it takes to *inhabit* sites of inquiry (Stengers 2008).

Learning through an experimental approach untethers the researcher from the epistemic baggage that comes from empirical sciences (Jellis 2018). That is, this research does not seek to test hypotheses typically associated with 'experimentation'. Experiments located in this study disrupt this idea by making no explicit distinction between the terms 'experience' and 'experiment' (Stengers 2008). A reclamation of experimentation considers how the form of the experiment might, in turn, reframe research through design practice. This has led to research work in this study documenting and reflecting on 'innovative forms of methodological experimentation' (Dwyer and Davies 2010, p.95).

The use of 'experimentation' argues that all research is ongoing participation with the world (Jellis 2018). Jellis recalls an "awkward role of not knowing quite what I was attending to" (Jellis 2018, p.54). Jellis highlights how participation in research involves a diverse range of activities, requiring the researcher to embrace the contingent nature of participatory inquiry. It underscores how participation precedes recognition and that the emergence of awareness is in a state of ongoing participation with the 'unfolding relation' of collaboration (Jellis 2018, p.231). This doctoral study engages with an 'unfolding relation' as a negotiation of both participation and experimentation. With Jellis, I work to recalibrate 'participant observation' through an experimental practice as an active process of attentive participation—a 'joining' of the research as a site of learning.

Speculative experimentation articulates the emergence of the possible. This process creates lures that lead to a more attentive practice (Wilkie, Savransky, and Rosengarten 2017). An experimental practice of attentive participation does not look to reveal 'truths'; instead, it works to 're-animate' research through creative practice. Experiments that 'fail' are bodies of a process rather than unwelcome outcomes or 'findings'. Furthermore, experimentation outlined in this study form methods seeking to shift the energies of collaborative research through practice-led processes. Experimentation disrupts my design practice, shifting what I have come to understand as designing through practice-led analysis that appreciates an expanded role of designer-researcher in relation to states of becoming.

1.3.5 Grounding the Project

This research convenes Project Grounded Research (PGR) as an approach to situating practices within the doctoral study. The program (ILETC) led toward the project (PhD: Making Space) that enabled the research to be realised. PGR was developed by design researcher Alain Findeli (1998) who seeks to anchor practice research through project-led inquiry. PGR proposes the construction of valid and trustworthy knowledge in experiential sites of inquiry (Joost et al. 2016). According to Findeli (2016), our task as design researchers is to ensure that

the investigation is rigorous, consistent and valid. The development of rigour emerges as it progresses—we develop our tacit impulses for investigative curiosity through rigorous exploration and experimentation.

Design research, situated through lived experience, enables the testing of ideas and prototypes against the project situation—within the liveliness of an experiential context. Findeli paraphrases John Dewey (1859—1952) observing that design research is to be 'prophetic', not just descriptive: "Attentive knowledge of design practice is necessary if one attempts to improve it" (Joost et al. 2016, p.29). What does it mean to give attention to design practice? As my experiments took shape, the attention toward how these experiments were in fact about attention became apparent to me. Experiments within a PGR made possible methods and instruments that distinguished the product of the research from the process of researching; from a fragmented practice toward a sense of the whole. Or as Dewey puts it: "Inquiry is the controlled or directed transformation of an indeterminate situation into ... a unified whole" (Dewey, Ratner, and Post 1939. p. 104-05).

A PGR framework aligns with an experimental approach that seeks to produce knowledge through 'prototyping new possibilities' (Vaughan, 2017, p.101). Binder and Brandt (2017) cite Schön (1983), who argued that design practice is a unique kind of experimentation that surfaces the possibilities of our imagination in tandem with the problem space or situation. The reflective practitioner is in dialogue with the 'materials of the design situation', thus engaging both problem and solution through an iterative framing and re-framing process of discovery. For this research, the 'materials' align with a notion of 'critical making' and how we might craft new habits, new futures and new ways of being (Grocott 2016).

1.3.6 Situating the Researcher: Narrative Inquiry

Identifying the voice of the researcher in-the-midst of intersecting complexity is situated in this doctoral study through a practice of narrative inquiry. Narrative Inquiry supposes that our understanding of experience comes to us through stories. Studying narratives is a way to join an analysis of our experiences (Riessman, 1990). Stories represent our identities and our social worlds, or as Ken Plummer (2001) puts it: stories are "documents of life". This practice-led research questions how the 'reading' of workshop documentation data as a story might be expressed and communicated through a designerly lens. In turn, practice research generates a speculative inquiry through the narrative of sense-making.

Bochner (2001) laments how the 'rules' of social science privilege "rigour over imagination, intellect over feeling, theories over stories, lectures over conversations, abstract ideas over concrete events" (p. 134). By emphasising the role of imaginative storytelling, I engage with data corralled by a practice narrative that propels the methodological inquiry. Narrative, in this way, helps to situate methodology:

> "Story, in the current idiom, is a portal through which a person enters the world and by which their experience of the world is interpreted and made personally meaningful. Narrative inquiry, the study of experience as story, then, is first and foremost a way of thinking about experience" (Connelly & Clandinin, 2000, p.375).

Expanding on a model of inquiry that builds experience and story in qualitative research, Clandinin and Connelly (2000) developed a model of narrative inquiry influenced by Dewey. For Clandinin and Connelly, Dewey transforms the commonplace term of experience into one that can be understood as a term of inquiry—a term that allows a richer understanding of practice: "For Dewey, experience is both personal and social ... People are individuals and need to be understood as such, but they cannot be understood only as individuals. They are always in relation, always in a social context" (Clandinin & Connelly 2000, p. 2). Learning is nested in the individual, the social, the community (and so on) which suggests a continuity of experiences. As a practitioner in this continuum—the now, the past and some imagined future—each of these points has a past experiential base and leads to experiential futures (ibid.). As a method for situating me as the researcher, narrative inquiry reveals new understandings and meaning from experience. It's a meaning-making process that considers the continuity and wholeness of an individual's life experience."Think of the life being expressed not merely as data to be analysed and categorised but as a story to be respected and engaged" (Bochner 2001, 132). Bochner (2001)

describes how staying with a story without abstracting through theory can permit reading and reacting from the source of our own felt experience(s). This leads to greater respect for the story and the people telling those stories.

Narrative Inquiry draws attention to the relational; between the researchers' and participants' lived experience, and between human and non-human actors. Narrative inquirers are inextricably connected to how the lived experience develops as it unfolds—and cannot redact themselves from these relationships. Lieblich (1998) states: "Part of the narrative inquirer's doubts come from understanding that they need to write about people, places, and things as becoming rather than being" (Lieblich et al. 1998, p. 144). However, It is challenging to locate a stable definition of narrative in research (ibid). According to SAGE Research Methods (Jupp 2006), Narrative Research is any study that analyses narrative materials (p.3). Narrative materials, presented as research data, can be gathered as stories or observations. In this doctoral study, the narrative materials are generated by the designer-researcher through practice. As a theoretical position, narrative inquiry explores and understands the inner world of individuals through stories about lived experience. Narratives proved us aces to individuals' identities. It could be argued that personal narratives are people's identities. Stories in this way present the inner reality to the outside world as the story is an identity. A narrative methodology can reveal and enrich data that conventional methods struggle to obtain. A narrative inquiry is generative, accumulative, and interpretive. As such, it engages methods appropriate for this doctoral study that uses a 'makerly' mode of research.

Typically in narrative studies, there is no *a priori* hypotheses—the study becomes directed as it unfolds—emergent readings of the data and any collected material then leads to the generation of hypotheses (Glaser & Strauss, 1967). Research activities that generate data are, in turn, interpretive, and that interpretation is always personal and dynamic (Lieblich et al. 1998). According to Bakhtin (1981), this requires a dialogical 'listening' to three voices: the narrator; the theoretical framework which provides the concepts and tools for interpretation; and the reflexive monitoring of the act of reading and interpretation. This last voice is the 'witness' of the storytelling, a self-awareness of the decision process that draws knowledge and meaning from the materials. 'Listening' is an interactive process—one that engages with the narrative with sensitivity to voice and meaning. Theories are generated through this reading and analysis, which leads to further reading and analysis. This refinement of understanding leads to a parallel formation of methodological identity and theory. "In its most prevalent forms, narrative research does not require replicability of results as a criterion for its evaluation ... Thus readers need to rely more on the personal wisdom, skills, and integrity of the researcher" (ibid). This process calls upon the intuition of the designer-researcher. A designerly sense-making is enrolled to service the comprehension and communication of research findings.

The narrative inquirer begins with the experience as expressed in the lives of the individuals studied, including how their stories are told—and this story includes that of the researcher. The autobiographical frame of the researcher is the starting point for the orientation of this research puzzle as narrative inquiry positions the researcher 'in the midst' (ibid, p.63); located within time, place, and the personal and social. Being in the midst means being in the middle of a nested set of stories. As an approach to informing new understanding, narrative inquiry occurs in-the-midst of an uncertain set of nested stories—the researchers and the researched. Joining is key to understanding the relational work of narrative inquiry.

1.3.7 'Joining' as Practice

Chapter 3.1 presents 'joining' as an emergent practice within the methodological inquiry. This section introduces an outline of joining from within the conventions of Participant Observation (PO). Section 1.3.6 identified this doctoral study approaching participation with the design-researcher 'in the midst' of complex social practices. In the midst of this complexity, a narrative inquiry approach has enabled a broader expression and exploration of values, widening understanding both within and without the practice frame (Lloyd & Oak 2018). The narrative emerging from within practice entanglements is identified through Participant Observation (PO). The focus of joining, a method of PO, is given attention as a catalyst for creative exploration.

Schensul, Schensul, and LeCompte (1999) define PO as: "the process of learning through exposure to or involvement in the day-to-day or routine activities of participants in the researcher setting" (p.91 in Kawulich 2005). This definition reveals the value of learning for the participant observer—the PO is situated and 'exposed' to the lives of participants in a way that reveals the setting of the research and in turn, makes the research object more tangible. The advantages of using a PO approach lies primarily in the validity and quality of an interpretive understanding (Peterson et al., 2010) lending itself to the nature of this practice-led inquiry. The interpretative perspective gives the collected data a richness that is difficult to access otherwise. Data, in turn, can involve a very detailed personal witness to the lived experience of the participant.

Significantly, research produced through PO is characterised by a personal knowing and understanding. For PO in action, this is referred to via Max Webers (1864 - 1920) concept of *verstehen*: an empathic understanding of human behaviour. Developing empathy in a participatory design approach is now a well-documented method for designing with, rather than for, communities affected by design (Schuler & Namioka 2017). The use of empathy helps assemble a richer understanding of a 'user' or 'participant' and has resulted in a variety of approaches for designers seeking to surface deeper qualities through their design process, addressing the impact design has on the social worlds being designed for that has typically been absent in conventional design approaches. It is through *verstehen* that PO can reach a deeper appreciation of lived knowledge as it emphasises participation and observation through joining. From this conceptual basis, joining becomes a method for making sense of collaborative research through the experiences of the designer and the participants.

PO, in turn, advocates an intentional 'joining' the world of others—a particular group or community—in order to better understand the everyday locations, activities, or practices of that group (Peterson et al., 2010). Meaning generated through PO is best understood through an analysis of the sort of observation being used, and the sort of participation being observed. A richer appreciation of the dimensions of participation and observation in PO will lead to more profound revelations of the thematic narratives emerging from the data. In this study, both participation and observation are corralled through the activities of co-creation— a mode of 'making' and 'designerly' ways of thinking about and through situated problems. According to PO, when the researcher becomes directly involved in the activities, they can better understand the present moment of that site of research (Schmuck, 1997). As a doctoral candidate and the designer of these activities, this is manifest through the facilitation of workshops and experiences that utilise co-creation as the mode of expression and communication. A co-design approach amplifies participant interactions, assisting the researcher in determining who interacts with whom; how participants communicate with one another.

This study posits that the design researcher facilitating collaborative workshops inhabits a speculative 'joining' as a critical practice. This affords an opportunity to participate in the sense-making that is vital to the co-design process and outcomes. Furthermore, joining presents the design-researcher with the potential capacity for interrogating the 'co' in design through speculative methods of 'joining'. Joining the teachers through design enabled revelations around practice and pedagogies by permitting a co-creation of pertinent conversations. Observing and facilitating workshops through a practice mode as well as participating in the conversations involved clearly articulating how the designer joins other practices in collaborative research settings.

Developments in social science research consider the role of practice in understanding how 'doing' and 'saying' can provide a richer understanding of the world. The 'practice turn' in the social sciences has directed attention to practice as a social site of research (Bueger & Gadinger 2018, p.2). According to Schatzki:

> "The social site is a specific context of human coexistence: the place where, and as part of which, social life inherently occurs ... this site-context ... is composed of a mesh of orders and practices. Orders are arrangements of entities, whereas practices are organised activities. Human coexistence thus transpires as and amid an elaborate, constantly evolving nexus of arranged things and organised activities." (2002, p. xi)

The 'mesh of orders and practices' both forms and transforms the one who practices (Kemmis et al. 2014). This is true of the world where the practice is occurring. The teachers' 'development' is usually determined through the mechanics of 'professional development', one that presumes to understand with little knowledge or concern of local context (Kohli et al 2015). co-design practice, it is argued, builds capacity for more meaningful learning through the undetermined, or indeterminate surfacing of mindsets and beliefs. PO becomes an activation of new practices for the co-designer 'joining' the world of teacher practice through creative methods.

Joining as Co-Facilitation

In this research project the community is 'joined' through the facilitation of co-design. A critical approach is taken to this co-facilitation, framing practice through the tenets of critical theory: "Critical theories aim at emancipation and enlightenment, at making agents aware of hidden coercion, thereby freeing them from that coercion and putting them in a position to determine where their true interests lie." (Geuss, 1981). In the context of this research, a critical practitioner takes into consideration the impact of 'joining' at the site of research activity, expanding what it means to 'join' participation. A critical approach draws the practitioner closer to the site of the research activity and the impact of participation.

Thus, I conceptualise the PO-designer observing the 'stage' of the researched. This unfolds like a play that is suggested to the actors through their own action and experience, where a plot is revealed through the real lived experience of the actors (Lippmann 1922). Co-design workshops frame a 'scene of action' and allocates the material and symbolic quality to the social interactions of participants engaging with the creative prompts. Like all dramatic scenes, there is conflict or tensions on the stage that requires the researchers' attention. According to Schostak (2010), the projection of the observed world and its inherent boundaries is most obvious when there is a tension or clash between alternative perceptions. This tension is referred to as intertextuality, where multiple points of view regarding actions, events etc. contribute to an intersubjective sense of generalisability and validity observed during field work. Intertextuality develops a sense of connectedness through shared stories and histories, becoming vital data for the PO (Schostak 2010).

Crucially, the PO contributes to these stories through various degrees of participation. The PO develops learning and analysis, taking note of emergent knowledge or theories connected to the world being studied and observed. In that, the PO must give focus to a sense of the common world, the shared reality, brought forward through the intersubjective reality of the lived experience of the participants (Schostak, 2010). If the research reaches a point where PO can represent the intersubjectivity of this constructed world in ways that the participant can recognise that world and their practices—this is considered valid and reliable as knowledge corralled through PO. Making sense of these moves in collaborative workshops looks at both the intentionality of participation and the facilitation of creative collaboration. Data capture locates the thinking, dreaming or deliberate sense-making of all participants, including the facilitator. This might manifest as thinking, touching, sensing—states of mind that give focus to an object or the quality of things or events (Schostak 2010). In the setting of this doctoral research, intentionality was understood through the ways in which participants engaged with the making and material encounters framed by co-design facilitation.

Data analysis focused on observing the 'talk' of both human and non-human actors. The convergence of the human and non-human actors within this lived experience can be understood through the notion of an assemblage of creativity (Deleuze and Guattari, 2013). Creativity is a function of an assemblage where participants become capable of creative practice through the nonhuman or 'more-than-human' (Braidotii, 2013, in Duff & Sumartojo, 2017). That is the bodies, actors and forces that also participate in the production of creative work. Facilitation, in this scenario, is a force at play that is critical to how the creative practice is enabled and directed. This force can be appreciated through returning to the notion of joining as participant observation joins the community at the site of research in order to facilitate co-generative learning. Facilitation makes PO more than simply a method of data collection—it is a way to live and create with a community and become part of the data itself (Schostak 2010).

The PO-designer facilitates how data is represented, analysed and interpreted. PO data collection requires an active entanglement of the researcher with the participants in the community that is being studied. The designer becomes involved with the community as they engage with a sense-making process. This entanglement of researcher-facilitator/participant is through indeterminate modes of creative engagement that invites a form of participation allowing uncertainty to frame how conversations unfold. Thus, the designer becomes involved in the community of co-design, both facilitating and participating in community discussions—observing a community of learning in action. Joining a community of creative play is a practical step in facilitating or meditating workshop flow. In this study, it is a crucial knowledge space for the designer-researcher looking to deepen understanding at the site of practice-informed research.

1.3.8 Summary: Practice Led Research

Part 1 has introduced the overarching methodology as one that embodies and values a practice-led approach to research. This methodology draws on the concept of 'joining' adapted from PO, and builds narratives from practice in a speculative and experimental mode. An intentional approach to deploy multiple methods that integrates my antecedent graphic design expertise into new methods for attuning to people—an emerging expertise of sensing and analysing data. This part has outlined concepts accompanying these new conceptual paradigms, situating the evolving relationship between the researcher, literature, theory and methodology that is now explored in detail in the proceeding Parts 2 and 3.

2.0 Project

Part 2 presents 'Making Space', undertaken as Project Grounded Research (PGR) within this doctoral study. Substantive analysis of methods emerging from data collected from Making Space is outlined in Part 3. This Part 2 focuses on workshop activities, research design and practices, and crucially, the participants.

- 2.1 provides background and context for 'Making Space', outlines a research design, locates the practice, and who and how we engaged participants;
- 2.2 details the workshops—how they were delivered and, in turn, how they were received;
- 2.3 will segue into the final Part 3 of this thesis by way of a burgeoning 'joining' through collaboration at the site of this inquiry. 'Joining' evolves through designerly modes as the research focus shifts towards making sense of co-designing.

Outcomes of 'Making Space' are also available from the EXHIBIT that acompanies this thesis. These online 'galleries' act as an appendage to the images presented in this interactive PDF. Galleries can be located in the corresponding section of the EXHIBIT website that mirrors the structure of this thesis.

2.1 Background & Context

Chapter 2.1 outlines the background leading up to a research design for the Making Space project. This chapter describes how work preceding the central project (Making Space) determined the positionality of the researcher in-the -midst of the research inquiry, thus signaling how I came to be situated within the program-project entanglement. The research design will describe how the workshops were developed, including the context of how the workshops emerged from within the ILETC program. Further description of workshops is provided in chapter 2.2, followed by emergent concepts in 2.3, which leads into a more substantive discussion of 'joining' in Part 3.

2.1.1 'Regional Workshops'

Before designing and delivering Making Space, a series of 'Regional Workshops' (ILETC, 2016—2020) was designed with, and for, the ILETC program as an innovative approach to priming the research space the ILETC program was investigating. These Regional Workshops became a significant case study preceding 'Making Space'. Workshops informed a substantial contribution to how subsequent approaches to working with participant-teachers was developed through modes of co-creation.

Regional Workshops deployed an ILETC mode of 'design thinking' as a strategy to elicit data and to engage with participants. The use of design-informed processes that point to innovative approaches in deepening our understanding of teacher practice is significant for the ILETC research reporting (Mahat et al. 2017). Workshops were determined by ILETC research questions and aligned with broader research aims of the program. ILETC workshop outcomes provided the Making Space project with a primer—an opportunity to engage with collaborative practice-led inquiry and model how Making Space might take shape.

Before the Project: Learning from the Program

The 'Regional Workshops' signalled an opportunity to develop a burgeoning sense of how to approach teacher participants through co-design. Workshops were a significant model of how to build capacity with teachers through modes of creative making. Conversations addressed how we perceive the affordances of an ILE in the context of their practice (Mahat et al. 2017). The design-led workshops connected teachers to their ILE and their practice. Design-led workshops were built to generate conversations that bring teachers closer to revelations about how they practice by surfacing values and beliefs. These design-led workshops presented the activity of designing to the teachers as a strategy for them to 'show' rather than 'tell' the story of their practice. Teachers employed a material thinking process as a means to communicate their practice to themselves, and each other—making tangible how ILEs could become closer to the teacher's range of practice-led expertise in activating the potential of learning environments more broadly. Building value through design hands over the 'making' of that value to the teacher-practitioner. We worked to facilitate the connection between the intrinsic, often latent, values of practice, to the extrinsic markers of expertise, made visible through co-creation.

Learning Facilitating

The role of design can also be conceived as a facilitating agent through which conversations take place. Through making, iterating, and visualising the story of change, teachers had permission and opportunity to envision their practice as an active conversation between themselves, their schools and school leaders. The connections teachers make form the potential to develop meaningful knowledge to engage their practice.

This invariably requires change, and the destabilising and often disorientating process of change can be bewildering. Design, in this context, acts to conciliate a sense-making process that can excite the possibilities of change—not through denuding immanent complexity—rather by allowing play to negotiate the complicated messiness, drawing out the full gamut of teacher agency. These approaches highlight the role of designing for non-designers as a medium for engaging creative methods that reveal new potentialities. Creative inquiry, adequately facilitated, has the potential to make known a greater expression of understanding. However, to appreciate the inner workings of creative strategies, furthering our capacity to comprehend the outcomes of this process might be of assistance.

Data Collection & Analysis

In the ILETC workshops, data analysis "utilised traditional qualitative data analysis approach, including coding, identification of themes, triangulation, model building and theory linkage of responses on post-its, text derived from the worksheets, and illustrations or models provided by participants" (Mahat et al. 2017, p. 16). In keeping with this qualitative data analysis, the technical report continues to note that; "design thinking approaches required some modification to ensure that categorical data was collected from the sessions to allow for this analysis. Collecting participant responses via coloured post-it notes, photographs of assemblages, and short written responses served this need" (Ibid p. 16). This approach presents a tension for the design researcher gathering data from generative workshop encounters. Suppose the data produced is revealed through designerly methods. How might design research engage with methodological analysis of data that leads to an accurate derivation of meaningful analysis consistent with the design intent? The workshop design looks to surface what is not known as well as what is created or imagined future scenarios. A traditional qualitative analysis looks at the world as it is, whereas a designerly approach looks at how the world could be. The 'Regional Workshops' were generating data that was corralled through methods foreign to design practice. Methods from traditions of qualitative analysis were foreign to my practice, and this led to questions around how we make sense of data generated through the sense-making of co-design practice.

This research argues that design can surface an unexpected framing of knowledge that is adjacent to qualitative methodologies, and that unsettles the hypothesis through conceptual reframing. To fully comprehend the role of this knowledge, and design expertise in this context, a stronger appreciation of methodologies that could contribute to how we conceptualise the role of design in interdisciplinary contexts requires further analysis, an opportunity I took up with the 'Making Space' project. The question remains as to how we derive meaning from this synthesis of data and how design thinking workshops present a capacity to reveal a plethora of data that can be challenging to interpret. What the ILETC approach revealed to me was a gap in how we 'read' the outcomes of collaborative creativity in the context of interdisciplinary research. It seemed like the qualities of designing that led to the generation of data were not being used to analyse data outcomes. Be uncomfortable with the data analysis led me to consider how we might develop methods that better respond to the affective fabric of designing. How might these methods be understood in ways that are emergent and processual?

The 'Regional Workshops' primed my co-design practice to consider how we might create workshops alongside attendant methodologies, building knowledge through the collaboration at the site of the research entanglement.

> *At this point, I sense new forms filtering through the interstices of this delicate negotiation with an unfamiliar practice. I have, of course, collaborated as a designer—but this felt different because the object of the designing was so clearly social.*

> *This time the 'proof' appeared before me as a set of relations being built in-between 'Things'. A 'proof' was 'materialising' through creative play with participants who had focused investment in the outcomes of the design. I have never really designed like that before. Suspended in-between the Participatory Design 'Thing' and the 'no-thing'. Vertigo ensues ...*

The outcomes of the 'Regional Workshops' speak to some fundamental aspect of co-design that is emerging through my engagement with this research. Locating this interdisciplinarity is an emergent state of sense-making that led to how I approach the research design of 'Making Space'.



Figure 8: Scenes from the "Regional Workshops", ILETC 2016

2.1.2 Making Space: Research Design

Introduction: Situating the Workshops

The following research design outlines the co-design approach that determined the collaborative practices detailed in chapter 2.2. The focus of this research is joining ways of becoming with collaborative research. This focus emphasises how this 'becoming 'manifests in practice, and how the design researcher might develop ways to respond to, and learn from, collaborative practice-led research. Therefore, the outline of this research design, and subsequent reporting of workshop activities (2.2) describes the processual in order to situate the focus of this research—the transformational process of becoming a researcher through design. A greater emphasis on these key doctoral contributions will then be covered in Part 3 of the exegesis.

A Collaborative Approach

Making Space was conceived as an innovative methodological pairing of Participatory Action Research (PAR) (Denzin and Lincoln 2005), and Co-design (Melo, 2018). This collaboration was conceived as an instrument for exploring teachers' practice development in relation to new learning spaces. As collaborative researchers, we aimed to integrate information, methods, data, tools, concepts and theories from respective bodies of knowledge (Klein, 2015).

Methods employed in Making Space became fundamental to the creation of data characterised by an interaction across the PAR and Co-design approaches. Generative collaboration was significant for the ILETC program, as Making Space uncovered knowledge in partnership with teachers through the integration of their lived experience within the research framework. The significance of Making Space for this PhD lies in the opportunity of researching as a Participant Observer (PO) within the PAR, developing co-design methods that situates designing within interdisciplinary research methodology.

> *Initially, this felt like a compromise of the practice-led research I had envisaged for co-design. It deferred to the more systematic methods of PAR as the main conceptual frame ...*

Compromising

Making Space required negotiation with the interdisciplinary 'in-between-ness' (Fensham and Heller-Nicholas 2018, p. 29) encountered within the ILETC program. A sense of compromise is felt when qualitative research methods or quantitative data gathering seems counter to the creative and emergent methodologies typically employed by design practice-led research. Social scientist Mike Michaels has outlined an elegy to compromise experienced in his interdisciplinary work with design researchers (Michael 2018, p. 279). His experiences share tensions that arise when there's a mixed appraisal of the value of divergence in research. That is an unsystematic 'playful' engagement with the users of the design vs. systematic data collection for assessment and analysis. It suggests the need to evaluate the ways in which we attach values to our research methods. Michael places value in the clarity of a research question—and the empirical evidence that emerges from a rigorous investigation. For design researchers, question(s) emerge from doing the research.

Designers, Michaels observes, are just as interested in framing of the knowledge as they are concerned with investigating the processes that went into making the research artefacts. Although initially threatened by the designerly approach, through compromise, he could appreciate the emergent nature of designer's practice-led research and began to see it becoming the machinery of interdisciplinary research (ibid, p. 280). Michaels recognised how practices make the realities of ontologies (Stengers and Annemarie Mol 2002, in Michaels 2018), and these ecologies of practice (Stengers 2008) yield divergent ontologies. Compromising, therefore, emerges 'practically, locally and iteratively' (Michael 2018, p. 282). Making Space integrates the systematic observations of PAR, with the creative 'play' of co-design. The interdisciplinarity initiated a push-pull of disciplinary tensions and developed into a productive tensity of 'joining'. In this case, 'joining' describes the state of becoming I felt in understanding how I might 'compromise' as I iterate my way through the practice-led emergence of the research process.

Methodology: PAR and Co-design - a 'Meshwork'

To reiterate, chapter 1.1 describes how the PAR methodology directed this collaborative fieldwork, while co-design workshops were used to generate and collect data. The initial calibration of this project was framed by co-design in service to the PAR and ILETC research objectives. The overall research design illustrated in figure 1 outlines an embedded case study approach (Yin, 2014).

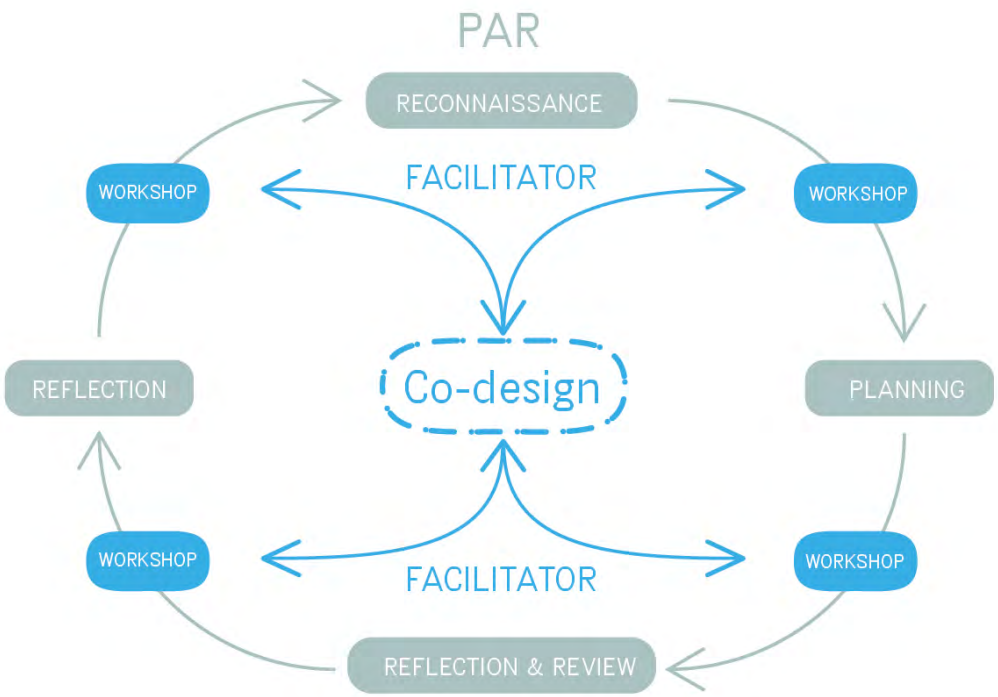


Fig. 9: 'Meshwork': PAR + Co-design

As this process unfolded, a stronger sense of 'joining' emerged. Tim Ingold's (2015) notion of a meshwork illustrates this research collaboration as a social inquiry from which I began to formulate my research framing Both PAR and Co-design employ distinct research approaches which rethink the relationship between, and foreground, the participant as researcher. PAR is known as a 'practice-changing practice' approach which aims to "change practices, people's understanding of their practices, and the conditions under which they practice" (Kemmis et al., 2014). PAR considers participants as co-researchers (rather than the researched), and they are therefore expected to make decisions about what to explore and what to change. PAR also encourages participants to form a community of practice, to develop improved understandings of their current situations, and to determine what actions may be required to both individually and collectively transform practices to meet the needs of changing times and circumstances (Kemmis et al. 2014). In so doing, participants may take ownership of the process, empowering them in the process of change. Through an iterative cycle, participants may plan change(s), act and observe change(s), reflect on the process and consequences of change(s), and then re-plan, act, observe and reflect again.

Similarly, Co-design employs 'designerly' modes of inquiry, as participants make and 'show' their voice through a material heuristic (Sanders & Stappers, 2012). These approaches informed workshops where the researchers actively involved teachers in design processes to ensure the designed outcomes met their particular needs. In this way, the use of Co-design strategies provided a pathway for participants to reflect on their own practices and gain deeper insights into the sites of their practice.

2.1.3 The Practice

A clearer sense of a co-design practice proceeded from the suite of 'design thinking' approaches in the 'Regional Workshops'. Each workshop in 'Making Space' was framed by a question derived from the PAR study. These framed the design of workshop experiences; however, the workshops afforded this practice-led inquiry a shift toward focusing on collaborating through design with the teacher-participants.

> *This time the proof resides within the curiosity that drew me to this site of inquiry. Training as a high school teacher has propelled me toward exploring ways in which teachers can build communities of learning themselves. To design them as engaged and effective and exciting. The pull toward this is important to me. I have worked in schools as a teacher, and I'm acutely aware of the pressures of teaching, and the w ay that structures and systems that encircle teachers and form prohibitive layers that act to ossify practice.*

> *When you work in a school, you get the sense that teachers are dulled by the very 'professional development' that purports to support practice. This always saddened me and has led me to this room, this workshop with these teachers, talking about what makes us tick. Wonder and curiosity might illuminate transformational refraction—the precious luminance of intrinsic motivation. Why do we do this? I suspect these invisible and unrealised forces are more powerful than the extrinsic clamp of 'professional development'.*

Activities introduced the teachers to the research, how they might actively contribute to the study, and how the research is applying reciprocal use for their practice as they transition into teaching in an ILE. Designerly ways of knowing are embedded in practice, in the making and doing that is part of the design process. As part of this research process, in order to enable participants to discuss and share their insights openly, it was considered important to quickly develop an understanding of this designerly approach as a way of learning and collaborating.

In discussing the use of making as part of the study, one teacher noted "doing hands-on activities with these teachers I don't get to spend a lot of time with, and to do different things, that sort of broke down the barriers and got us working as a team" (Teacher A, School A). A capacity to communicate through designing was taken into consideration in this collaborative research context. Engaging participation through designing is not only instrumental as a method—but it also responds to the broader demands of practice transformation (Barry, Born, & Weszkalnys, 2008).

2.1.4 The Participants

Two groups of teachers (n= 11-14) were recruited to participate from two different girls' secondary schools (Years 7-12) in Sydney, Australia: both in the process of designing, constructing and inhabiting new ILEs.

School A is a large Catholic girls' secondary school with a population of nearly 1000 students. The school has an agenda to transform learning in order to build students' capacity to learn, create and adapt to a fast-changing world. This transformation agenda relates to five key components including pedagogy, professional learning, pathways, partnerships and learning spaces. Pedagogical development is expected to support inquiry-based and student-centred approaches where students will learn alongside partners from industry, university and government. Teachers will work together using data and research to develop best practice in supporting students in the pathway or qualifications which best suit them. Major improvement of buildings and therefore, learning spaces is seen to be one of the components required to support the schools' transformation agenda. A Commonwealth Government Capital Grant has enabled a major building project at the school involving the replacement and refurbishment of spaces which have been deemed not to meet building standards or are inadequate for contemporary learning.

School B is also a Catholic girls' school. At the time of the research, it had an enrollment of 675 students. The school's learning philosophy is based on the concept of growth mindset (Dweck 2017), supporting a view that students' talents and abilities can be developed through effort, good teaching and persistence. The majority of learning spaces at this school have been traditional classrooms. The exception is a small 200 square metre classroom block that had recently been refurbished into a prototype ILE space: a dynamic new space intended to support teachers practice development in advance of transitioning into a large new Year 7 and 8 learning centre and whole school library designed around ILE concepts. The prototype space was able to be occupied by two or three classes of 25 students at the same time, offering a range of affordances for learning, such as would be incorporated into the Year 7 and 8 learning centre and library. Data collection was conducted over a series of six workshops and associated interviews, informed by a PAR cycle augmented with Co-Design workshops (*figure 9*).

Within each participating school, a specific research question positioned the focus of the research collaboration. The question asked at School A was: How can we prepare ourselves to use our proposed new learning spaces effectively? While the question asked at School B was: How can we enhance our use of our latest prototype learning space for student deep learning? These questions reflected the contexts of each school and how this might influence their 'transition' into new learning spaces. School A's ILEs were yet to be built, while School B was in the early stages of occupying an ILE prototype within an existing building, created ahead of the final design and instruction of a much larger new building on the campus. The workshops shifted in focus and intent and developed as the outcomes of the workshops unfolded. Despite the workshops being designed and facilitated by the researchers, the issues explored were primarily determined by the teacher-participants. This became significant as we developed targeted workshops and made the best use of the affordances of creative collaboration.

2.2 Making Space: The Workshops

Chapter 2.2 presents an outline of how the workshops were designed and delivered. A substantive analysis of data from these workshops is provided in part 3, examining how data informs the emergence of practice-led 'joining' central to this doctoral study. The following workshop synopsis provides a concise report on the workshop activities which is not to be misunderstood as perfunctory. The workshop outline communicates the activities and the tools for engaging teacher-participants. However, this doctoral study focuses on how the *outcomes* of these workshops as data to prompt experimental methodological inquiry. This creative and analytical practice reflects the ontological entanglements present in this study (see section 1.2.3).

The first workshop was framed explicitly through the PAR research. I'm designing to draw out responses from teachers that speak to the 'spatial affordance' (PAR question) by using the language of learning principles. The learning principles is a language that teachers can appreciate, and that speaks to their practice.

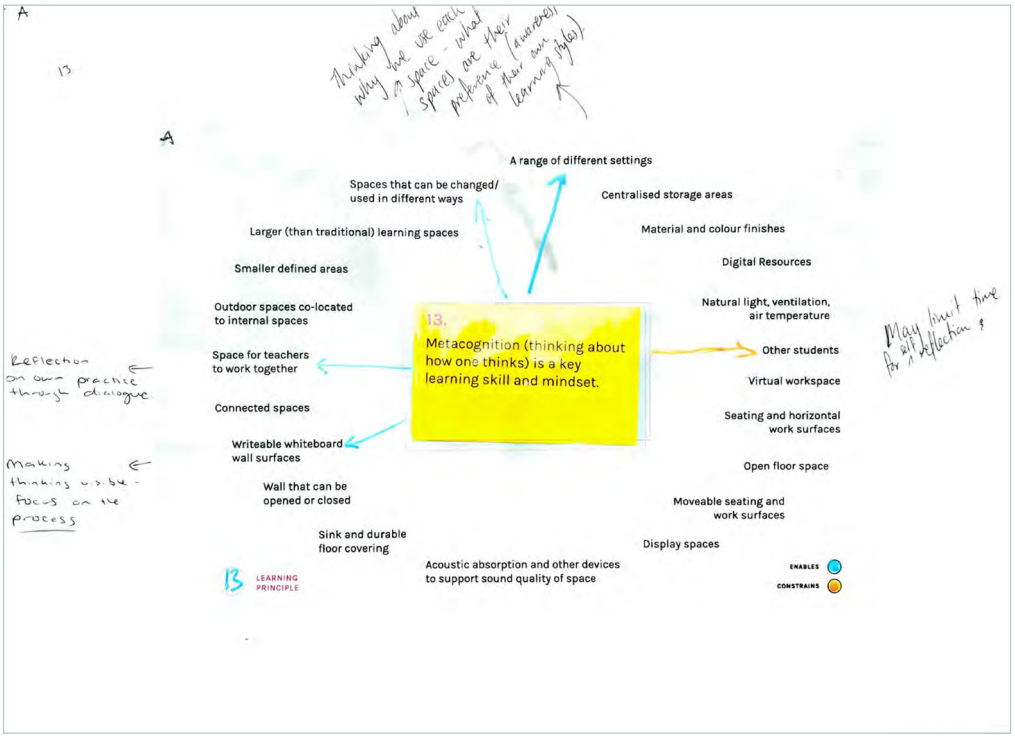
The regional workshops demonstrated to me that collaboration through co-creation requires participants to subscribe to the methods as valid and valuable. The designer can't assume that the participants will simply be 'on board'. This time, we begin with a language that aligns with the epistemic beliefs of the teacher participants—then move toward the 'creative emergence'.

2.2.1 Workshop 1: Learning Principles

Workshop one engaged teacher-participants in discussions about the affordances of their learning spaces. A range of spatial qualities of learning spaces identified by Young, Cleveland, Imms (2019) was printed onto a transparency sheet. Teachers were asked to associate these spatial qualities with a selection of broadly adapted learning principles. Some examples of these learning principles include:

- Metacognition (thinking about how one thinks) is a key learning skill and mindset;
- Deep learning often happens when students are confused, struggle, and even fail;
- Collaborative learning with lots of student talk is an effective way to learn;
- Lessons should be designed to accommodate a range of learners; and
- Getting frequent feedback and ways to use it is important for student learning.

Teachers worked together to match spatial qualities with learning principles and were able to identify the spatial qualities that either enabled or constrained their practice in relation to selected principles. This first conversation with the teachers, and with the setting of the research, surfaced connections teachers made with their implicit motivation to teach (crafting effective learning) and the external setting of their teaching (spatial properties of learning environments). The workshop was also crucial in establishing the material affect of co-designing as an approach to making conversations. This was aimed at their own capacity to recognise and name their expertise (learning principles) and to connect this to language that was not perceived as intrinsic to their practice (spatial qualities).



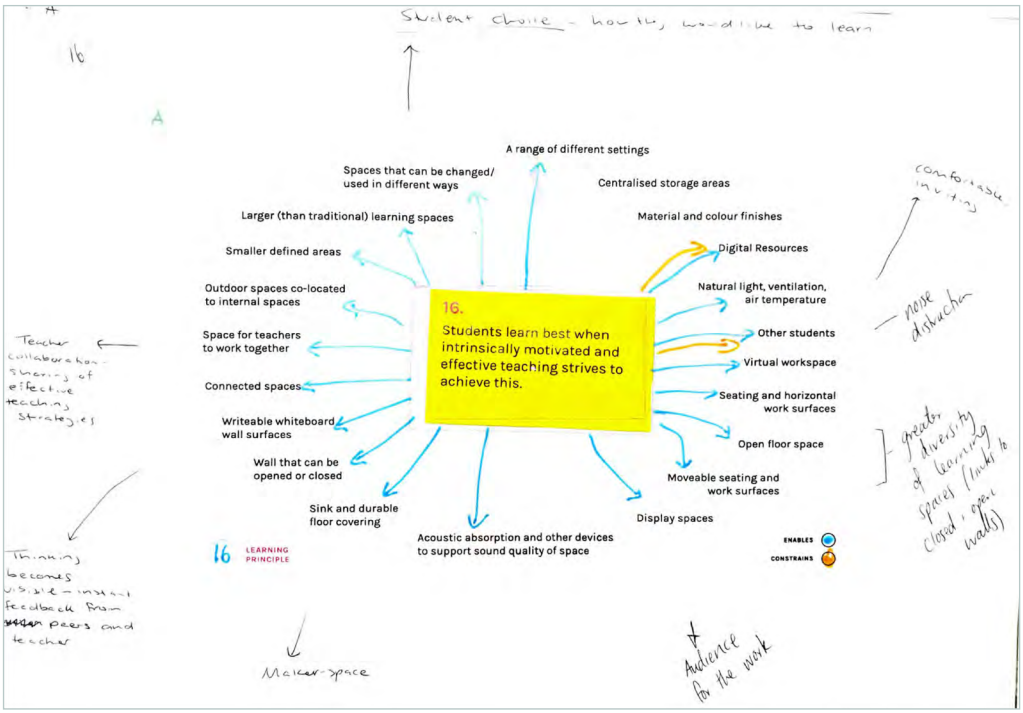


Figure 10. Example of enabling and constraining factors of spatial qualities associated with learning principles, as identified by teachers

The regional workshops primed my sense of how teacher participants respond to prompts. We engage their language. This function must precede the formal qualities of designing appealing experiences. The look of the workshops—the surface—generates visual interest can go a long way in holding participant attention. But real shifts happen deep within the language that engages the participation.

Anyway—I feel this really worked in the first workshop. Teachers couldn't stop discussing the learning principles. This language became a successful catalyst for moving between what happens in ILE spaces, and what happens in teacher practice.

2.2.2 Workshop 2: Constellation of Practice

Workshop two introduced an approach to surfacing conversations with the teacher-participants that engaged a material-led framing through the metaphor of 'constellation'. The regional workshops left an impression of the tools that co-design can typically use in order to create engagement through play. The use of metaphor, in particular, holds a powerful conceptual framing that can enable ways into difficult conversations that are typically inhibited by the weight of complexity. Metaphor is useful in this context to awaken participants to the moment. In the workshop, the metaphor acted to reveal to participants something in their current predicament or their experiences as a teacher that resonated with the metaphor. The metaphor brings associated thoughts to mind—there is something in the language or the emotional body of the metaphor that can trigger metonymic connections.

A constellation of suns and planets was the metaphor used as a vehicle to elicit participant reflection on the initiatives they had trialled arising from workshop two. Participants worked in small groups to make representations of the factors influencing their practice (see example in Figure 5). 'Planets' represented teachers' practice, and a selection of playful materials were used to make representations of learning environment affordances in 'orbit' or these 'planets'. Participants worked together to identify affordances that enabled practice, such as 'space stations' (a metonym for teacher planning/collaboration zones), and constraining affordances, such as 'black holes' (a metonym for students unable to cope with excessive noise). After discussing each groups 'planet' (practice) and 'orbiting objects' (affordances), participants were asked to link their planets to other groups' 'orbiting objects' (affordances), to help identify additional affordances that might better support their own practice.

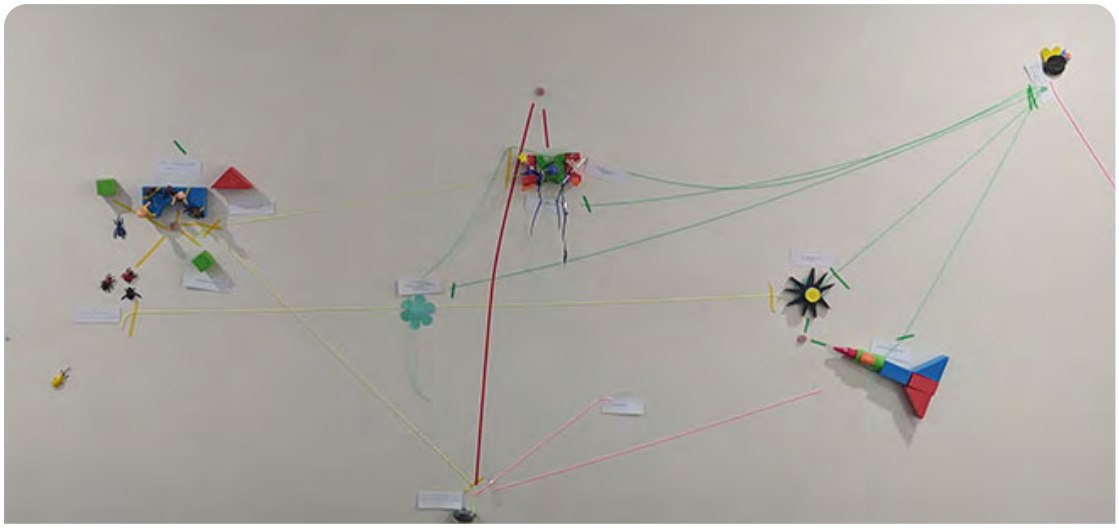




Figure 11. Images from Workshop 2 : teachers collaborate using playful materials, reflecting on initiatives explored following Workshop 1.

This time around I felt I could launch into some creative play. More materials and a metaphor to house the discussion framed the workshop. Teachers came with enthusiasm for the discussion as the previous two workshops had set up this more substantive conversation: what is going on in your ILE and where do you see it heading?

This led into workshop 4, which was a more literal translation of this conversation into a 'floorplan' of their current ILE alongside a projection that speculates on possible ILE use. How do these affordances manifest in practice? Workshop 4 felt quite literal. I wanted the teachers to have an opportunity to see a direct relationship between what we were doing, making 'solar systems' and what was happening/will be happening in their ILE.
Not that I felt they couldn't make the leap, more that we could dedicate the time together to seeing that applied—and they could have a conversation about it together in the time dedicated to this 'professional development'.

2.2.3 Workshop 3: My Space

Workshop 3 encouraged teacher participants to draw spatial arrangements (or annotated floor plans) that best represents their changing practice. They were then asked to create another drawing that floated over this arrangement (again utilising the transparency film with markers) to represent their practice after changes had been made as a response to the previous workshops. What had been 'activated' for them?

They were asked to draw what they felt their practice was 'becoming'. Stickers used to symbolise both the human and non-human actors impressing upon this practice scenario as they were encouraged to use these stickers and mark-making as an expression of their future practice.





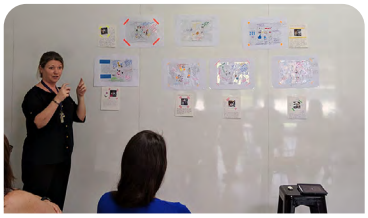




Figure 12. Teachers presenting their 'practice shifts', showing 'before' and 'becoming' spatial arrangements

With hindsight, they could easily be doing this in their own time. What is my role here? The time together in a co-creative space needs to activate models of poetic expression that they can take with them to their own discussions. This again points toward the limits of what I'm able to do with participants. What is outside of my control? What is the value I bring to this 'coming together' and showing up with each other in the name of building a community of practice? I wonder if I will be able to see this in the data I retrieve from these encounters. I wonder.

This is the voice. This is the voice that is continuously coming into being. Becoming. I now sense this voice in the milky margins of my practice—becoming through the research. The more I engage in this research the further I locate myself in experimentation; looking for better questions to ask about designing with communities or practice. This isn't unexpected. However, I feel a sense of bewilderment at how these concepts emerge before me in the stewing uncertainty this co-creation stirs.

2.2.4 Workshop 4: Field Guide

Workshop four focussed on priming participants to 'perceive' affordances of their old/existing learning spaces alongside their new ILEs. This workshop explored teacher perceptions associated with changes in practice that they believed would need to occur if they were going to teach effectively in the new learning spaces.

The workshop comprised three parts: From a range of characters (figure 13), participants selected avatars that reflected their current personal experience. On a topographical map, participants constructed interventions which described their sense of the current learning environment context and placed their avatars into that scene. Participants created field guides which they could use to observe issues or factors they had identified as important in the process of practice change. It was expected they would use these field guides (see example in *figure 13*) prior to the next workshop.





Figure 13. Workshop 4: Avatars, maps and an example field guide

2.2.5 Workshop 5: Making Space

Our final workshop focussed on encouraging conversations around what support structures might help them 'actualise' the affordances of their new ILE spaces. This involved teachers in three activities:

- Reflecting on observations of practice charge, as guided by the issues and factors outlined in their field guides;
- Synthesising practice change observations within an affordance ecology framework: infrastructure, practice and organisation;
- Exploring floor-plans of their future ILE spaces using the newly created Making SPACE tool to reflect on furniture, teachers and students in order to determine what protocols might be needed to work together effectively (*figure 14*).



Figure 14. Workshop 5: Example field guide, affordance ecology activity and Making Space activity.

Proof: As If—

Airport to studio. Studio to workshop. Checking material inventory.

I'm negotiating the combination of sandwich/coffee/phone on my lap in the front seat of Fiona's Outback. The instructive cogency of Google Maps' muffled directions forms a sharp relief against the messiness of it all—as if—we're making this up as we go along …

It develops as it unfolds, all this. It's as if this messy process with these teachers is becoming clearer through shared designed experiences. This is an unchartered mode of designing for me and one that responds to shifts in how I'm experiencing 'co-creation'. What emerges from our shared story telling is a new story of what it means to be a designer. But rather than this being determined through literature about design (or how the discipline has and is expanding) this is discovered through a practice of joining these shifts with others.

It was all made up—fabulation as method is becoming clearer to me through this makerly mode of research. The more I make as a researcher the more I get this. I'm not looking for 'what is', I'm engaging the participants to quite literally make up stories. These stories are deliberately teased out of the workshops as critical artefacts. As the workshops start to hum along the teachers begin humming their story.

These stories are a creative non-fiction. We are not making up the facts that determine their reality, we're making up how we perceive these facts. This imaginative process is a creative otherness and we begin to form a sense of practice. It isn't happening within our practice; it's happening without—

2.3 Joining With Teachers

Chapter 2.3 segues into Part 3, alluding to a persistent theme in this doctoral study: designs capacity to engender learning through collaboration. Specifically, this chapter begins a discussion around how design might become a mode of transformative learning. This chapter teases out these themes prior to a more substantive look at how methods emerge from within an analysis of Making Space.

2.3.1 Learning as Collaboration

The collaborative methodology adopted in this research gave teacher-participants as co-researchers a framework to surface and explore a wide range of issues relevant to their practice context. When investigating the process of practice change in new school learning spaces, aspects of time and teacher agency came to be recognised as critically important. Reflecting on the research process, one teacher noted:

> *You can't really fast track it because you've got to have time to go and put it into practice and try a few different times … and then see how it works and go and talk to somebody else and fiddle with what you're doing and have another practice at it (School B).*

The collaborative approach to methodology positioned teachers as researchers of their own practice and gave them agency in the way they investigated the use of space, empowering them in the process of change. Further, combining the PAR framework with co-design tools gave participants the freedom to explore and play, whilst ensuring some structure and direction was present to direct the research process towards addressing each school's research question. A senior teacher at School B felt that the research process had enabled them to delve deeply into issues around practice change:

> *As teachers—and even as an executive—we sometimes jump to the product and we just want a framework or guidelines to tick a box. But this process really has been about experimentation and play and discovery for teachers which is really valuable (School A).*

The school's took up the co-design 'tools' used in many of the workshops to continue generating open-ended discussions and assisting teachers in recognising the potential of space as a learning resource. In describing the impact of the research on the teacher-participants as co-researchers, a senior teacher at School B, responsible for leading professional development, noted:

> *I think those workshops and the way that they ran took them (teachers) to the place that they needed to be. If I got up at a staff development, I don't think they would have come to that realisation on their own. It would've been me telling them. But I feel like that journey … they came to that point on their own (School B).*

From Teacher-as-Researcher to Designer-as-Researcher

> *What the teachers taught me is that my practice of designing, now situated in this site of collaborative research, needs to find its way of joining the world of transformation that co-design promotes. This prompts a process of learning from within the collaborative research.*

These practice-led research encounters reveal how teachers could become comfortable in exploring their pedagogical approaches and working closely with colleagues. The methodology affirms how shifting teacher practice requires ongoing and situated effort, and that critical to empowering teachers to actualise the affordances of ILEs is providing them with the time and space to collectively develop their practice with each other—for this to occur concurrently and collaboratively. These insights were revealed to the researchers and the participants through a co-creative engagement at the site of inquiry.

I see it happening to the teachers, but how can I make sense of the shifts occurring to my practice?

The results of the workshops produced swathes of data, presenting an opportunity to delve into data analysis. This opportunity afforded a meaningful methodological adjacency with PAR that builds towards an experimental research practice through design.

The variety of collaboration revealed how I was joining my own practice as much as I was joining the teachers' practice. It felt like a live-in prototype of emergent learning. I was researching my practice as a designer and I began to see how the surface of that exploration demanded methods that better reflected the affective texture of co-designing in order to satisfy a more meaningful engagement. Speak through the material language of design to better name it—and know it.

An absent presence in these narratives is Fiona; my collaborator. We threw ideas around on the way to and from the workshops. On the way to the workshops we knew what we were going to do. It was as if we had a plan. On the way home from the workshops, we had no idea what to do with what just happened. We knew it happened. We captured it—hours of video footage, audio, still images, artefacts stuffed into my suitcase ready to be probed. A happy exhaustion of having completed the workshop still drying in my memory; and me trying to still the internal jiggling of thoughts, feelings, sensations … still in my body, still ringing in my ears. The body remembers—but how do I explicate this kind of knowing? And still … there were few words or pithy remarks that I could muster that would give me the sense of having expertise in this area. What—just—happened—?

We laugh at some of the amazing things the teachers said. Not in jest—our laugh moderates a reaction to this giddy out-of-our-depth feeling that came from throwing ourselves into collaborative encounters with the unknown. The laughter belies the pressing PhD anxiety and it feels like schoolyard misbehaving. To allow emergence there is a sense of permission to allow not-knowing (or: 'knot' knowing?). To not-know why certain responses were made, or why participants responded in certain ways, said certain things etc. We sat with 'what' rather then 'why'. Fiona's Subaru started to feel like a kind of mobile fabulatory— freighting collaborative ideation as it emerges from inside this Outback.

2.3.2 Prototyping Practice

In Making Space, prototyping practice with the teachers focused this doctoral study: how joining a speculative analytical framework might reveal design practice from *within*.

'Making Space' prototyped teacher practice through the material *affect* of co-designing. As co-researchers, teacher-participants were encouraged to trial and test the initiatives surfaced in workshops so they might embody the ideas directly in their practice. Participants recognised that the act of trialling new approaches was critical to becoming empowered in the process of change:

> *The biggest thing that's come out ... is trying to make us feel less uncertain and more empowered ... to interrogate what we do, but not be afraid of trying new things. I feel much more empowered now having done the workshops than I did at the beginning. I think for me ... the overall impact is to just try things. Have a go, you know. The girls aren't going to no learn anything, and you've just got to ... take that leap of faith (School B).*

This resonates with the findings of Lackney (2008) who suggests that teachers are more likely to gain insights that support teaching and learning from direct experience and experimentation, as opposed to formal 'professional training'. Our workshops prototyped spatio-pedagogical models that were then shared in a collective, collegial and reflective way.

The intent of a prototype was developed with the teachers as a form of design 'mockup'. This mockup communicates back to the co-creators involved as they iterate and develop ideas—learning from the prototype and developing it—exploiting strengths, mitigating weaknesses. What happens if that object is alive in the practices, the moves that the practitioner makes in articulating the object of their craft?

> *Is the 'proof' of a live-in prototype this conversation with a state of becoming? It's as if we might see the object of practice as a kind of prototype, alive to a future that develops as it unfolds. A live-in prototype looks for its own formation, and perhaps it is in that seeking that meaningful relationships are created. This is not a prototype as a static point in the design process—it's a fluid form that speaks to what is happening in and around practice.*

> *We focus on the prototype as a model of possibilities. It might do this by revealing limitation or highlighting context and use. But if we're prototyping practice, then the model is alive, embodied, and reflexive. It is alive in its participation with possibility.*

2.3.3 Making Communities of Practice

Teachers reflected on the impact they felt the collaborative research created in giving them a sense of belonging to a community of practice that had engaged collective learning in a shared domain (Wenger 2015). In discussing the value of shared dialogue, one teacher noted:

> *Producing a product of what we were doing at the time didn't really matter. It was the process of trying to think about what it would look like and spending time with somebody else talking it through, that really helped (Teacher, School A).*

Generative discussions surfaced through the workshops revealed a shared teaching experience. This created insights into how other teachers approached teaching and learning in different environments. A teacher at School B reflected:

> *We kind of figured out what worked, what didn't work and what kind of things do we enjoy doing: what are we comfortable within the classroom. You know, some of my boundaries are different to say Jodi's (pseudonym). So things that she values and are important to her aren't necessarily mine. So it's about contextualising that use of space for different teachers and different personalities (Teacher, School B).*

A recognition of the importance of participating in a community of practice was identified as critical in assisting teachers in developing and shaping new practices in ILEs. These insights into the teaching community highlighted the importance of a collective and collaborative approach to practice change and the need to generate a co-created vision for how ILEs could be activated.

The shifts teachers reported in their feedback is encouraging as results of how a PAR/Co-design might situate collaborative participant-led research. This feedback informs how I develop 'joining' into the third part of this thesis. To better understand how we join with others, I argue that co-design must look within—into how we join resultant data of co-design encounters. The following part inquires into this supposition. Joining data from 'Making Space' becomes a methodological inquiry into how co-design shifts with practice-led research.

> *The focus of my research has, from the outset, been about the teachers. I joined their conversations about how they engage with ILE's, how they form a voice that reflects their experience of teaching in an ILE (or perhaps how they anticipate what it will be like for them). What I'm finding, as I move through my practice and engage with it as a researcher, is that the questions that emerge direct me toward my practice as a fledgling co-designer—*
>
> *I realise I cannot effectively help these teachers until I have developed a holistic understanding of my design practice—particularly collaborative design. Becoming with them in their practice questions was fundamental. I can see them shifting in their responses and engagement. But the gap I identify is not in their practice, it is in mine. The site of my research inquiry has shifted as these realisations crystallise emerge. I want this research to inform co-design practice so it can then, in turn, be more useful in the creative exchange of joining with others.*
>
> *This shift has been in seeing how prototyping practice with teachers has led to how I prototype my own practice as a designer. Is design its own prototype as a method of social inquiry? We are finding models of practice in the way we relate design to other disciplinary areas. I'm finding my feet as a co-designer by working with the 'other'. Understanding this 'co-designing' is forming as it's researched. It develops as it unfolds. I'm beginning to join the research as a site of methodological inquiry.*
>
> *After the teachers, I look toward my own practice as the object of this research.*

2.3.4 Summary

Part 2 has outlined 'Making Space', Project Grounded Research within this doctoral study. This Part has detailed workshop activities, research design and practices, and how engaging with the participants assisted the shifts this research project has provoked through practice. A burgeoning sense of 'joining' through collaboration at the site of this project begins to evolves through designerly modes as the research focus shifts towards making sense of co-designing. The following Part 3 will delve into a more substantive outline of methods emerging from data analysis unfolding after 'Making Space'.

3.0 Discussion

> "For the living being, the joint ... is not so much an exterior connection of rigid elements as an *interior condition of correspondent movement*, bonded on the inside by means of a linear mesh of ligaments" (Ingold, 2015, p.25, my emphasis).

Part 3 develops theories and methods of joining as a critical contribution of this doctoral research specifically, how practice-led design researchers might become attuned to a practice of becoming through 'joining' data.

The preceding parts of this thesis have outlined how, as a design-researcher, I have joined a collaborative research program (ILETC) as a co-designer in service of the program aims. This led to creating a collaborative research project (Making Space) through designing and facilitating co-design workshops as a Participant Observer (PO) of Participatory Action Research (PAR). The project, within the program, led design to 'join' a research process that augmented PAR through co-design practice. The project introduced, by way of PO, a method of joining that situated the design researcher in the midst of the collaboration. Thus, this process has developed a generative adaptation of 'joining' as a speculative and experimental mode of data analysis. Part 3 is organised into three chapters:

1. Chapter 3.1 joins 'joining', providing further detail as to how joining a PO of a PAR develops into 'joining' methods of data sense-making.

2. Chapter 3.2 contains the speculative 'As If—', a framing of the emergent nature of this experimental research. Discussion extends the 'knot' as a mode of becoming, attending to how we might develop and education our attention in order to know a practice of becoming.

3. Chapter 3.3 concludes this thesis with discussion surrounding the significance of this study. This includes how conceptual constructs might be transferred beyond the doctorate, and potential applications of findings from within this research to areas outside of design.

> *It wasn't joining with the teachers so much as uncoupling from them that consolidated my realisation of 'joining'. After the workshops, I sensed a practice taking on a new form—but I didn't know what to call it. I simply sensed how I must learn how to better know this emerging practice—this is where I suspect transformational potential resides—and research activity, led by co-designing, has been a catalyst for this expansion in my thinking. I sense I now inhabit a 'joining' from the inside and I'm looking for a methodology …*

As this research progresses through an experimental approach, at this point of the study, research is untethered from the epistemic baggage that comes from empirical sciences (Jellis 2018). This discussion focuses on the practice of co-design and moves away from teacher practice.

> *A methodological joining with the data produced through my research practice is now critical to the contribution I seek to make. The sense of disorientation I felt in joining the teachers is replaced with a different sense of joining—one that looks inwardly toward the shape that emerges from inside of practice. Noticing this from with-in, drawing it from with-out.*

The framework discussed throughout Part 3, emerges through speculative experimentation with methods that act to situate my relationship with the data in relation to the practice of co-designing. Experimentation with data analysis aims to better 'inhabit' a process of analysis, asking how we might create better methods for engaging and emerging with data produced in collaborative practice-led research. Speculative experimentation seeks to position how a 'designerly' joining with data might create methods of analysis. Data, analysed through the invocation of joining, is appreciated as a process of becoming.

3.1 Joining Joining

Chapter 3.1 focuses on how joining a PO of a PAR develops into 'joining' methods of data sense-making. This further attends to an expanding methodological inquiry, describing details surrounding the experimental methods emerging at the site of analysis.

This chapter describes how 'joining' has emerged from the research. I identify with a graphic design practice through the things produced (a 'proof'), and I locate a shifting practice leading this research within a world of 'Things'; socio-material assemblies (Bjögvinsson et.al 2012).

> *This practitioner-researcher is searching for a 'proof' that describes the qualities of 'Things' in order to know them better.*

As design practice continues to reform through a 'social turn' research that informs practice following these shifts into new social modes of production.

> *What might a practice of joining look like? I want to retain a sense of my 'craft'—how might I imbue 'Things' with qualities that activate and shape the world? All practice is deeply situated, and I work to situate this practice of becoming ...*

The development of joining moves away from external relations and looks to find the internal moves I make that respond to the contingency of practice change—and to name the impact this has on practice-led research.



Figure 15: Researcher in-situ, 'Hanging' with data.

This chapter situates a gap between the designerly methods used in co-creative workshops and the methods of designerly sense-making used to analyse data resulting from those workshops. This research invites a practice that inhabits this 'in-between' as a speculative mode of data analysis; drawing out original sense-making frameworks.

> *Lines of tape are holding together a reconfiguration of practice.*

I joined the teacher-participants through a PAR and Co-design collaboration; how might I join the practice of designing through the analysis and sense-making of data generated by that practice? This is a practice of data analysis that looks to join the outcomes of co-designing with emergent forms of knowledge creation through design-led practice.

3.1.1 Joining Methods

This following section outlines how the experimental approach to this research led to an original sense-making framework. These include 'Glyphs', 'BiTs', and using a 'hanging space' in order to 'join' methods.

'Glyphs'

Analysis of video data began with creating a 'proto-code' of what I named 'glyphs'. 'Glyphs' were a starting point—permitting play with this initial appraisal of images emerging from the video capture—a way into the analysis.

I designed a library of glyphs using the functionality of an Adobe Creative Cloud library (*figure 16*) to establish consistency across digital applications and to ensure coherent usage of these glyphs across the visual analysis. This worked to stabilise these marks in the early and messier stage of interaction with the data as I began to make sense of how to approach analysis.

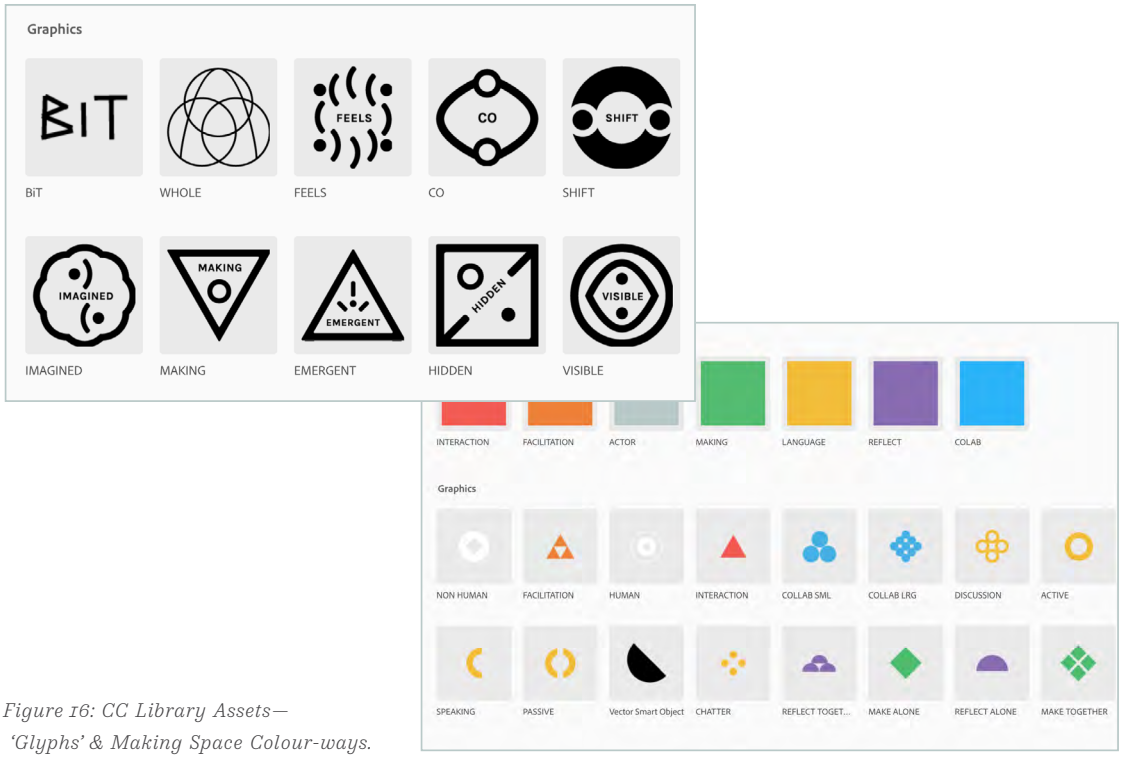


Figure 16: CC Library Assets— 'Glyphs' & Making Space Colour-ways.

A table of glyphs (figure 17) indicates each shape signifying a variety of categories that relate to the designer's sense of areas of analysis. This matrix can be reconfigured according to the visual analysis (figure 18).



Figure 17: 'Glyph's used for initial analysis

Transcripts of each workshop initiated an appraisal of the language being used by the participants. 'Reading' this language connected what was being said against the activity or action that framed it. For example, when I gave instructions the participants were understandably passive as they listened on. This could quickly shift into scaffolded discussion or spill over into unrelated 'chit-chat'. As language was recognised and coded using the yellow glyphs, the blue collaboration glyphs could be incorporated in relation to these yellow marks, giving shape to the emergence of a relational language being observed from these sites of collaborative conversations.

Making was simplified into either making with each other or making alone. As was reflection; seeing how the participants would reflect with each other and how that might relate to how they reflected on their own was key to reading the ways the workshops impacted on their language and ideation. Also taken into consideration, as indicated in the table of BITS, was the interaction between the human and non-human actors impressing upon this research puzzle. Facilitation was only given one glyph and was identified as 'making happen'; the role of the various actors (human and non-human in the room) that led to the facilitating of events and experiences directed toward the workshop intent.

Using the glyphs, data parsing could take place in creative conversation with stills from the video capture. The glyphs evoke a sense of what I'm looking at. This act of creative inquiry speaks to designer 'hunches', joining glyph to image through a designerly lens. This felt like a sort of retrospective storyboarding. Imagining the story in reverse. What was happening in these frames? Through what materials? etc. It felt like speculation as if data was emerging, rather than an analysis of the data as is.

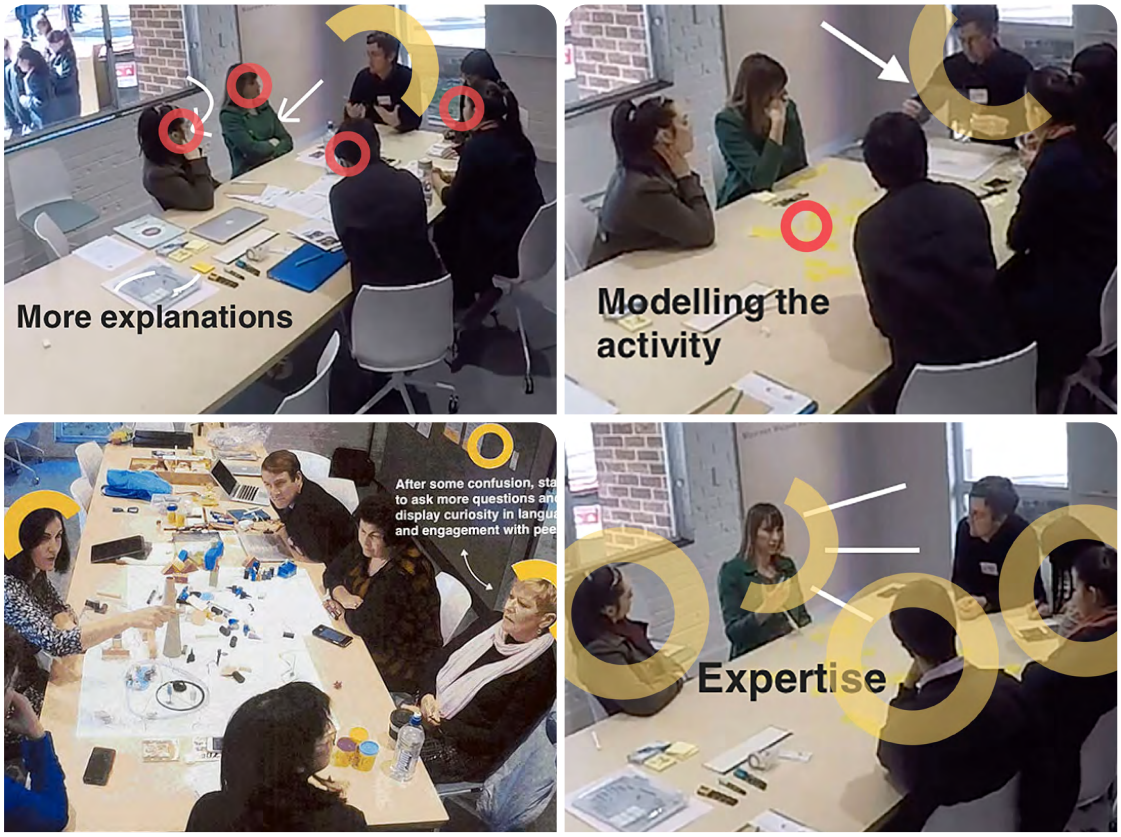


Figure 18: 'Glyphs' in use ...

Following an initial expectation that data analysis would follow a sort of discourse analysis—reading transcripts and coding research outcomes—I began reading and preliminary analysis of the data in a practice mode. This made it clearer to me that I was not 'reading' or 'coding', that I was actually 'making' with the data as a way to see the research through a material affect of designerly knowing (Grocott et al., 2019). This radically shifted my approach to how I subsequently approached the analysis.

The video footage is digital, screenshots of the footage are digital, and the glyphs are digital vector shapes. What I was looking for in developing and experimenting with this approach was an affective quality that would impress upon the data in the same way that the materials of the workshops affected the participants. It is a collaboration with the material learning that occurs through co-creation.

I found this in pausing the digital mediums and turned to ink and paper. An analysis using screen-based technology was an effective way into this process, however, this remained a process of being with data whereas I'm looking for a way to become with data.

> *The next move I made, in response to this irksome sense of limitation, was to go off-screen*

Becoming in Tune: 'BiT'

I developed the 'glyphs' into a set of traditional ink stamps. I gave these stamps the provisional name—a BiT: Becoming in Tune (figure 18). The initial glyphs established a process of tuning into the data and this attunement was crucial as I navigated the fledgling exploration. 'Becoming in Tune' was an experimental step toward a more speculative mode, one that works to inhabit provocative moves that I wasn't getting from the glyphs.

A BiT stamps the printed pages of data much like a drill bit burrowing into wood. BiTs impress marks that become an expression of a practice in search of self-knowledge—the designer-researcher in active conversation with sense-making. The discipline of BiT analysis became analogous to the composite imaging of detective work. Detective composites help identify possible perpetrators. Similarly, a BiT analysis puts together a similar 'forensic image' that engages with an imaginary and symbolic reading of the scene through a sense of what might be going on.

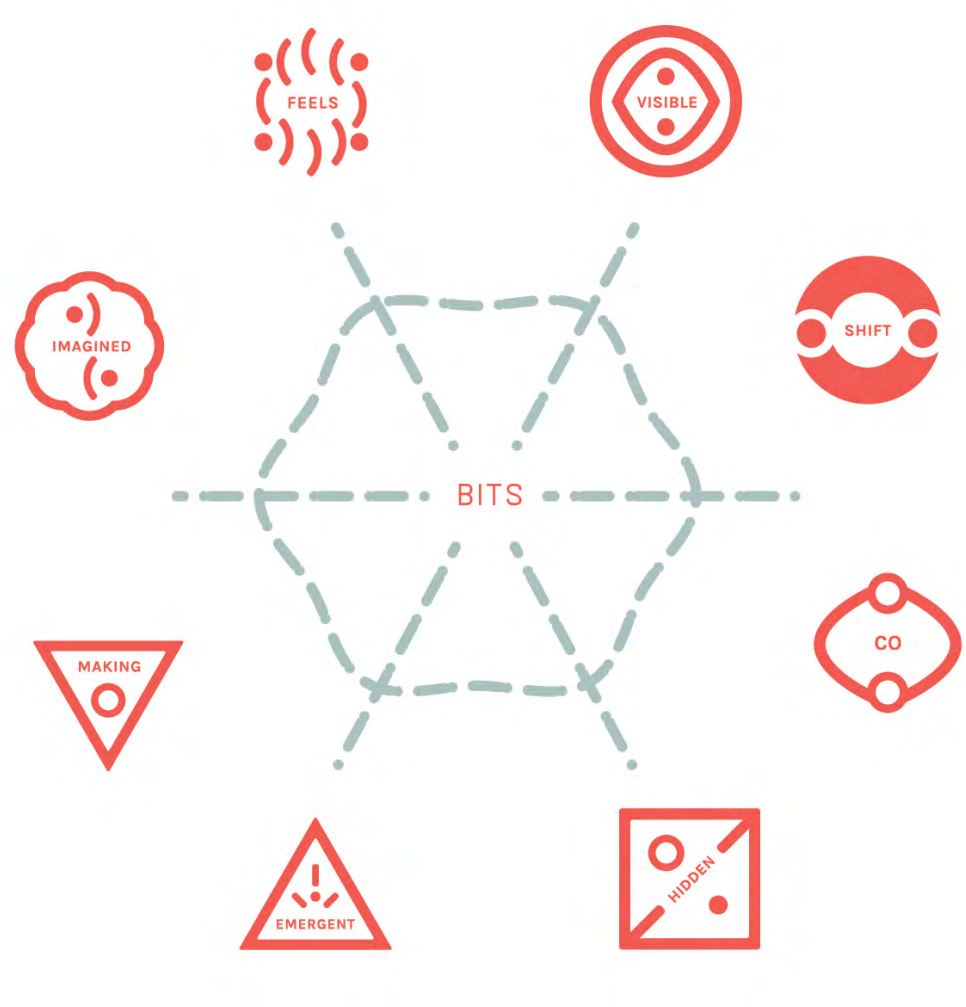


Figure 18: BiT (Becoming in Tune)

The BiT was a revelation. Using the BiT opened up the analysis in ways that felt like the processes of making I engaged with my participants. It had the affective qualities of making and sense-making that I'm familiar with as a designer, and in turn, it felt 'right' to be turning to the material affect of making in order to better connect to, and imagine with, the data.

The BiT developed from the glyph, and over the initial 'coding' as another layer of inquiry that augmented the initial categorisation—if felt like revelatory mark-making.

Intermission: The Forensic Portrait

It's a date—

Every Monday morning Wonderlab has a playdate. We get together and get curious—playing with the ideas and complexities that emerge from our design research. The early fragments of ideas are often raw and complex and compel the lab into creative exploration. In this space, we make sense of our proximal development. And we work together to pull into focus the common ideas that imbue the lab with Wonder.

It's my turn, and I wonder: perhaps design research presents an unfinished portrait of the creative outcomes (the information or the data that we go on to 'read'). This is not the kind of knowledge generation that is expected in the sciences, this is precognition, or the conceptual formation of design as a medium through which we interrogate the world. In this forensic portrait design is both culprit and investigator. This is a portrait that finds rigour in the imaginative, in the abductive delineation of imagined worlds—or the scenarios that grip us. The 'wickedness' of problems that resist linear resolution requires a willing to create 'portraits' of their research. The forensic looks to the trail of material or artificial (or emotional or cognitive) to compel a portrait in a way that presents a mode of design expertise as a creative frame.

I wanted to explore the idea of a 'forensic portrait'. An idea that I felt has been hanging around ever since I heard the idea of a 'serial killer wall' — a busy-wall of 'evidence' that builds a 'case' for the arrest of the suspect (you get the picture). I suppose the forensic portrait differs in how it hones the 'serial killer wall' into a more singular portrait. An effort to articulate the shape and profile of the research object-as-portrait. The 'forensic' leans toward a more concise outline of phenomena—or data—and locates the mechanics of inquiry.

So, I intended to run a proto-workshop that had fellow Wonderlab researchers building their own 'forensic portrait'. But that didn't happen. Instead we fell into a discussion about how to deal with mountains of data and how to know, in design research, how to resolve the framing of design 'problems' alongside locating the object of research. It's a playdate, so I went with it …

How could a 'forensic portrait' work?

I guess it depends on how you situate it as a method. In this context, the forensic portrait helps locate the kind of data that is useful in connecting the 'evidence' (I imagine this would be pretty consistent across PhD projects). I could imagine it being a useful priming activity before data is captured—to interrogate your question and speculate on the kinds of data you'll generate (and what could be useful). If there is one thing I have learned the hard way, it's to know what data you want to capture and why. Trying to capture 'everything' is bonkers and will lead to a colossal amount of information to sieve through. It's so easy to capture, so exhausting to interpolate into meaning-making.

What form would a forensic portrait take?

Any form really—it seems appropriate that the form of the portrait proximate to the thing (or Thing) that you're studying. It's really up to the researcher to feel their way through this one. This method is necessarily made up - the fabulation sets out to reveal the systems and structure of the problem setting. The real work of the designer is in seeing these systems and appreciating the contribution that design can make to shaping the change it seeks to prescribe.

Developing the BiT from research collaborations with colleagues in Wonderlab, I determined that the 'forensic portrait' is not an exercise in forming an external objective picture of the data that represents a universal image of the 'perpetrator'. Rather, the portrait of the data emerges from within—from the ways in which the researcher engages with sense-making (Yuille, 2012). The portrait-as-framework emerges as a sense-making model from the data itself. This is a portrait of the data through the lens of my own practice of sense-making.

The forensic analogue suggests a capacity to apply consistent methods to 'situate' a puzzling narrative. Like a detective, the designer puts together the artefacts of the designed encounter and the manner in which those artefacts come together—and the way they make meaning through that coming together—is a creative exercise closer to portraiture. It is a depiction of the data through the practice of design that enables the designer to speak to the data through a designerly knowing.



Figure 20: BiT data analysis

Proof: As If—

At this point, I pause to consider Tim Ingold's description of how we educate our attention. I'll come back to it again later in this Part 3. I consider how all this 'joining' is simply building a capacity to pay attention to that which arises from my relationship with the data. This attention starts by responding to the data, analysing what is there and tuning into what I know I can see. Then attention moves toward listening to the data and inviting contingency, or 'pushing the boat out to sea' as Ingold would say. It is submitting to the data in ways that open up to the unknown as an act that invites becoming. Rather than tuning into data, this allows the data to respond in ways that tune into my practice. This is the difference between perceiving the data and imagining it with the data.

So is data becoming a practice? Using a designerly mode to engage with the data acts to frame the data. This then transforms data through abductive processes of creative speculation, expanding designs' conceptual perimeter and how I might appreciate the ways in which designing acts in the world. How might this research work act with my practice? How might I become a practice-researcher through this process? I'm shocked into the practice of becoming. Not being with the design practice I have known—it is realising a practice of becoming through this doctoral research.

Design as a mode of inquiry can be quite reductionist—you know the scene: lots of generative sticky notes generate a shallow analytical artifice—how might we make a richer mode of analysis that pierces this fluorescent facade? I'm distracted by this dismissive critique …

Method can activate theory. Theory and method are the same because they are a way of seeing.

Theory illuminates practice? Method can be a performance of the theory. Enacting the theory—

Stamps are knots. Using the language of Ingold. It is the 'in-between' that I'm looking for. Not the between. I'm looking for the life of the in-between, the 'co' that shifts my practice—

This is the way I'm looking for a clearer picture of my practice and how it might shift through research. Through learning how to research.

Stamping invites a speculative practice of data analysis.

This is becoming through the data—realising practice thorough data. The data is not the practice, the data is the practice becoming. And it is always becoming.

In a co-design practice that engages with interdisciplinary methodologies what does design need to learn to develop a practice that keeps it relevant and keeps the contributions designers make current and relevant and valuable. I'm lost again.

Data as process+ Data as product = Data as practice?

'As If—this 'practice proof' is lost in Wonder. The thread of these narratives are returned back to the project: to activate ways of seeing my data through speculative experimentation. I turn back to my 'lab' and make things. This time I want to converse with the BiTs like I would with design students—to hang with the work.

Hanging

'Hanging' the marked-up data was the final act—one that felt like a design move. The BiT experiment developed into an analysis that further builds on the idea of 'joining'. In this case, joining (or re-joining) the actors in the screenshot frame in order to deepen an understanding of what was happening. This move continued the line of inquiry: how can I make the shifts I see in my practice more visible? More tangible? What happens if I just tape them back together in a gallery space? An analogue GIF?



Figure 21: Hanging out with the data

Utilising a 'hanging space' typically dedicated for 'rehearsing' the curation of art exhibitions, I rehearse a kind of curation that anticipates an interaction of creative work with the researcher. This experiment hung the data in a way that made it feel whole, and that situated a more embodied engagement with the practice of 'joining'. I speculated that joining the data together in space promotes a sense-making of the whole investigation. This looks to how it 'hangs' together, rather than examining discrete parts of this practice-led research.

BiT by BiT: Hanging with Data

The BIT's gave my research process a path into becoming with data through a practice that drew on creative strategies for 'writing' and 'reading' the feedback that the workshops revealed in the video capture. The hanging space became a container for the elaboration of joining as a practice that makes-sense of this process. Installing the work on a wall and being immersed in it dissolves the discrete spaces between researcher and data. You become intimately associated with a sense of meaning-making through practice.



Figure 22: Hanging; a panorama

The impetus for the 'hang' was relatively straight forward: to spend time with the data as a whole body of work and see how we get on. Joining the data in space amplified the connections made through BiT's. This was put into action by taping the screenshots of video footage on the walls of the gallery space, creating a space of contemplation. To 'hang' with these images meant being still with the movement and fluidity of data grabs. This fluidity contrasted with an intentional stillness of the hanging space—a space that afforded an opportunity to be present with the possibility of seeing the data as whole.

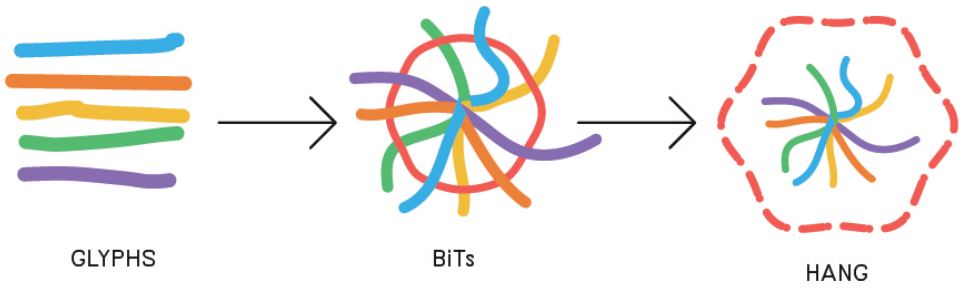


Figure 23: From glyphs to hanging

3.1.2 Joining Glyphs to BiTs and Hanging

As experiments with joining progressed an emerging sense of shifting values began to crystallise. I had been taught to appreciate the value of design through a commercial lens. My undergraduate degree in design positioned my practice as one directed in service of 'clients' and the accompanying economic value that design generates within the commercial logic of this relationship. I have, since graduating and becoming a practising designer, looked at how the work of the designer is situated socially and the impact the design has on the social spaces that design mediates.

Data captured in the Making Space workshops developed through the described methodologies which I developed within this research as a shift from perceiving to imagining new ways of practicing and learning from co-design. Data impressions are read through designing and leave a sense of what might be, rather than what is.

As the use of the glyphs helped to organise 'what is' my sense was that the process was limited to processes of coding that organise and categorise data but do not effectively work toward locating the practice-shifts of sense-making which I'm looking for in this research.

> *The data analysis started to sing to me in ways I hadn't imagined. This was the form I was looking for, and hoping for, in this method—a way to be with the data.*

The revelation of using BiT's shifted my sense of practice through re-engaging imaginative inquiry. The experiment of using stamps spoke back to my innate love of mark-making and using mark-making as a conversation with the world.

Having the individually marked up data was an act of re-imagining how we can interact with data through material processes. What I struggled with was how to piece it back together as a whole. I turned to my design teaching practice; I expect my students to 'hang' their work up and to be with the work in an act of embodied learning. It's a move that helps them establish a relationship with their work. I postulate that this helps us develop a conversation with the work, and that the work develops a conversation with us. I made this move with my own marked-up data by hiring a gallery space and installing an 'exhibition' of the data.

Installing the data on gallery walls afforded an opportunity to expand the use of materials incorporated into this analysis. Paper 'washi' tape became a means to engage with a material application of the 'lines' of Ingold's (2015) thesis—literally drawing these lines in-between the marked-up sheets of data.

> *Using the washi tape felt like weaving—or interweaving. Interweaving progresses the experimentation with materials and processes further, again becoming a moment of revelation as I continue to explore how I might engage my practice with this analytical process. The activity of interweaving led me to feel closer again to this data as I experienced a broader scope of inquiry. This time I embody this process in space and across time. I'm in the data.*

These experiments revealed the relational as a process of living with the interconnected nature of collaborative practice. The embodied nature of this process brought me closer to the site of research exploration in ways that stepped outside of the disorientating reconfiguration of designing into a practice transformed through collaboration. This felt like a different paradigm of practise that was inseparable from the research that had encouraged and generated this shift. It felt like becoming a design-research practitioner.

3.1.3 Joining Intra-action

As experiments with data analysis developed the methods drilled deeper into an experimental mode of inquiry. I framed this process through Ingold's (2015) 'knots' and 'lines', staying with the notion of practice as an active production of meaning and utility (Althusser, 2017).

Methods of data analysis shift from an interaction to an intra-action. I refer to this interiority, with Ingold, as a knot. 'Knots' are imagined curious amalgams of methods that moved through my experimental process of coding with glyphs, BiTs, and hanging. I illustrate this process (figure 24) as a shift from interacting with 'Glyphs' to a more complex and embodied intra-action with 'BiTs' hanging with the portraits of data. The resultant 'knot' is a method of speculative joining.

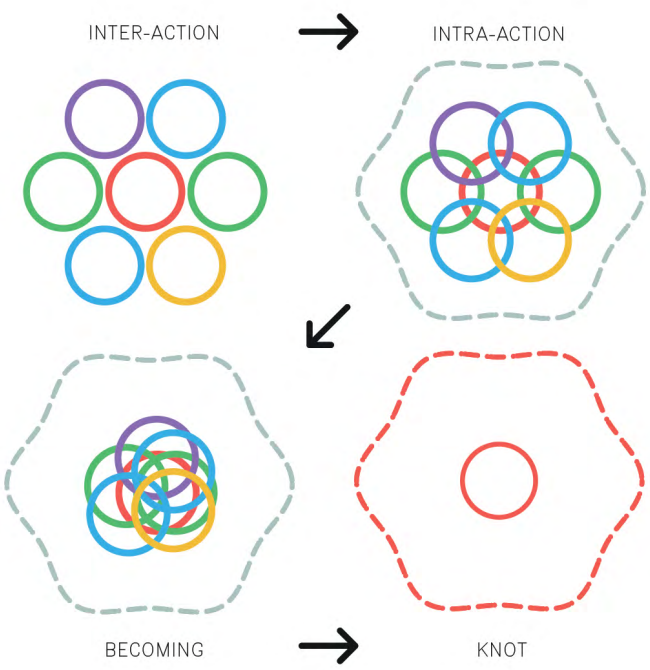


Figure 24: Emergent Methods

I developed the knot as a model of how we might approach meaning-making from within data created in co-design workshops. This seeks to meaningfully engage with data through the practice of design that I connect with—my antecedent practice of graphic design. The PAR analysis simply didn't speak to, in my mind, accurate analysis of data generated through co-creation. Or in other words, it didn't emulate the qualities of a practice that generated the data—a collaborative and creative practice of designerly sense-making.

Developing the exploratory 'knot' led to an expanded field of analytical possibilities. Imaginative engagement with the data enabled 'knotty methods'. From the initial joining of data with glyphs, towards stamping and marking using BiTs, and finally hanging as an experiment inhabiting the possibilities of 'joining' research through practice. These moves describe shifts in the relationship I have with the process of sense-making at the centre of this research. The process of analysis examines the data of 'Making Space' whilst exploring its own generation. Looking at the data through experimental methods revealed this process of analysis.

To further examine the 'moves' made in these experimental speculations, 'knotty methods' are described through 'compositing' (coding) and 'interweaving' (hanging).

Compositing & Interweaving

Compositing describes the initial interrogation of the data. The composite creates a 'portrait' of the data as an image begins to form—that is the researcher comes to an understanding of the composite as it is being composited. Initially, this process was one of categorising the action within the frame. The language, the materials, the interaction participants have with this setting and the behaviour that was elicited through the arrangement of the workshop, and the facilitation of the designerly intervention. In this way, compositing is closer to a categorisation model of data analysis where a framework for categorisation precedes the data.

Composite images were initially composed of screenshots taken from video footage that captured the data. Glyphs, applied to these screenshots, formed the initial efforts to 'code' the data and establish a coherent practice of analysis. This moved beyond the compositing of images using glyphs toward a more analogue process of what I referred to as 'marking'; using the BiT stamps—an extension of the glyph that gave richer texture to the material quality of the analysis.

To further this experiment, and to push toward a sense-making model of analysis where a framework might emerge from the data, I pushed the process beyond the individual 'marked-up' A4 page of image, glyph and BiT toward what I refer to as interweaving. Interweaving extends parsing the overall impression of the composite into a whole described as 'hanging', and aims to create an impression of the collective composite into a more intelligible whole. Hanging the compositions into a single space developed a forensic reconstruction that expanded from the inside out. A hanging process involves taping the individual frames back together. Hanging becomes a process of reenacting the moves of the designer. To make sense of the whole and to reconnect with the practice through making, and remaking, and making again. Re-making the video data into an intricate tapis makes an impression of language that speaks to my practice sensibilities. Hanging these discrete moments of practice, coded and marked up in the forensic portrait, required a process that moved it closer to the state of embodied 'becoming' that I question in this research. I moved again in an experimental mode to explore how I might install these discrete forensic portraits in a space that affords an expanded practice of sense-making.

WHAT IS (Perceiving) > WHAT IF (Imagining) > AS IF (Emerging)

The progression of this methodology gives form to a shift from asking 'what is' in the data, towards asking the data 'what if'; and perhaps to arrive at the more speculative question of 'as if'. 'As if' is an expression of a shifting practice beyond mere iterative change—it dreams of transformational shifts to design through research processes such as the one imagined for this study.

> *Design seems to learn its own language through iterative making. It's becoming that language.*

3.1.4 Joining Whole

In summary: glyphs contain the data — BiT's shift the data — Hanging *becomes* with the data. These methods formed what I conceptualise as 'joining'; a process of experimental inquiry that surfaces analytical frameworks.

This experimental exploration of methods assembled a speculative apparatus for engaging with data. 'Joining' leads to building an impression of the data through the affect of designing. Using the materiality of stamping, drawing, and writing onto the printed image led me to understand my data in ways that amplified my sense of expertise. Attending the data required an openness to the path of the research process.

Methods emulate a practice of analysis emerging from the co-design practice itself—a material engagement that searches for the whole story. This conditioned, unconditioned, and re-conditioned my designerly lens, interrogating the ways in which design tends to condition an expectation of 'innovation'. The analytical framework reveals the connections between these points and works within these tensions. Through the BiT, we drill into the data and mine for meaning. The framework imagines a practice of dismantling that helps form a reconditioned whole. Further outline is given to this idea in the concluding chapter 3.3.

3.2 As If —

The analytical framework of joining, explored in the preceding chapter, describes a shift toward a state that feels 'as if'—an evocation of a speculative mode that progresses from 'what if', typical of a design process. This 'speculation' revisits a move toward more critical or ontological modes of inquiry (see section 1.2.3, 1.3.3). 'As if' questions how the embodied methods previewed in this chapter might reveal practices of becoming with research. The following chapter follows this idea, revealing ways that joining has shifted toward an emergent mode 'as if'. An approach to inhabit this research 'as if' has enabled the development of 'joining' toward a state that might better inhabit the in-between so essential for co-design practice. These places of intention arrive 'as if' they're still in states of becoming. This is a state that encourages the metabolising of uncertainty. For the design practitioner making sense of collaborative encounters, knowing the emergence 'as if' holds up the value of not knowing (or knowing knots) and is central to enabling knowledge to form and communicate.

3.2.1 As If — Becoming Practice

It is 'as if' my design practice is becoming through collaborative research. This process does not describe these shifts 'as is', or seeks to locate universal knowledge that defines the changes design practice is experiencing. The methodological inquiry described in this research seeks to situate the designer in the midst of disorietnating change. This 'knot' of becoming surfaces through the apparatus of contingent practice.

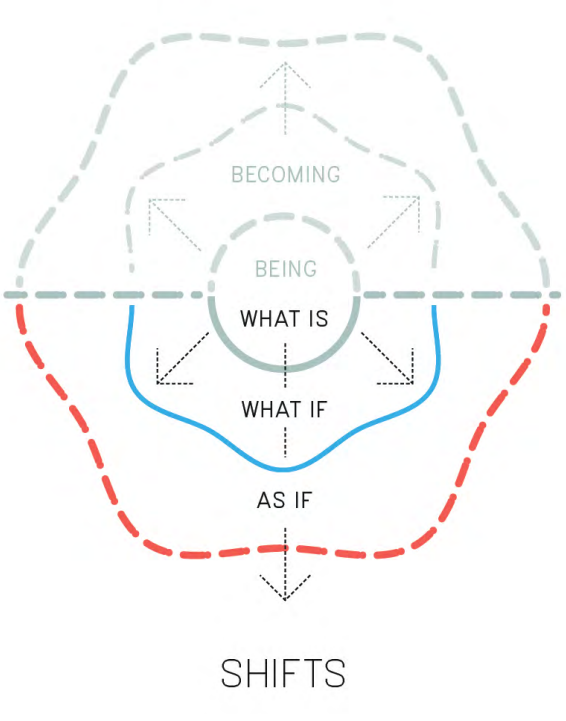


Figure 25: Imagining the Knot Shifting Practice

Figure 25 illustrates this as a 'cross-section' of the knot. From the centre, being with data looks at 'what is' occurring. A visual analysis using glyphs retells the practice pushing outwardly through 'what if' (what if I printed the data and made marks on the page?) and leading me toward 'as if'. 'As if' propels a speculative mode of experimentation that seeks to inhabit the research process. It is 'as if' that allows me to imagine methods that reveal a synthesis with the data that feels meaningfully situated within practice. 'As if' compels the move to 'hang' the data, a method of re-composing the analysis again in order to continue threading the knots toward becoming—a shift of transformative potential.

Ingold describes the experience of becoming in phenomenological terms: "the sentient being rides the crest of the world's becoming, ever-present and witness to the moment when the world is about to disclose itself for what it is (Ingold, 2011, p.69). These revelations position the creative movements of emergence (Ingold, 2015)—a suitable vector for this doctoral study that carries design from transacting with the world, toward transforming it.

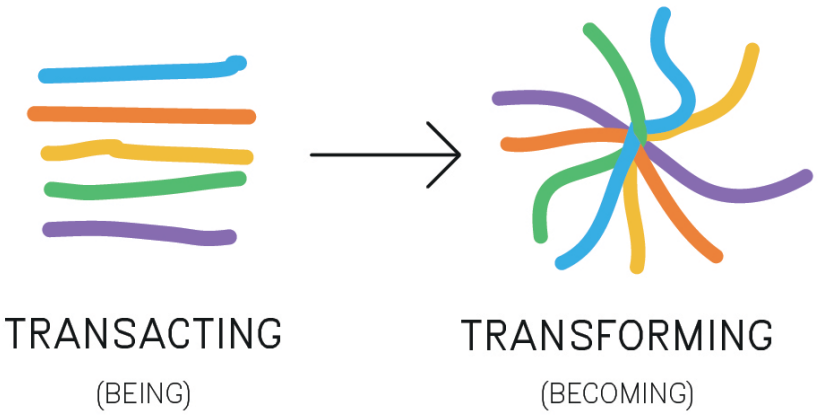


Figure 26: Being into Becoming

This corresponds to shifts from 'being' to 'becoming' through speculative methods of joining (figure X). These moves transpose practice from transacting with static methods, to transforming within the speculative 'knot'.

Designers make 'things' that don't just exist in the world—they also *occur*. For Ingold, this imbues objects with qualities described through the 'life of lines' where things carry a line of existence through the world that brings them to life. A world of 'things' isn't a world of objects, rather, it's a world of knots: an expression of the enduring internal and external conditions of becoming (Ingold, 2015). This returns us to Participatory Design: "... a fundamental challenge for designers and the design community is to move from designing "things" (objects) to designing Things (socio-material assemblies)" (Bjögvinsson et.al 2012, p.102).

The 'Things' found in this research are social-material assemblies; they are the 'knots'—an expression of becoming. Ingold further posits that a world where things come into being by processes of growth and movement is a world of life (Ingold, 2015, p.14) and that the process of 'knotting' is a principle in this process helps us know this world of becoming. However this doesn't deem the 'knot' to be a 'tool', 'building block', a 'chain'. These have (respectively): explicit structures; articulated and rigid elements. All are bound to their own being, whereas the knot is constituted by becoming. The 'Life of Lines' proposes this state of becoming as a way to consider ourselves, and the things we make and do, as a shift in how we engage with our world. This project proposes how this might occur through collaborative design research, as if—

> *Becoming is an act of imagination (of imagining unknown relationships)—*

This research follows a story of my shifting relationship to design, and how it is revealed in this research as a practice of learning and becoming. Practice-led research is approached in review of, and renewal with, design within a methodological inquiry.

My education in graphic design was training that reflected and responded to the expectations of commercial design practice. My goal was to get a job. This, as expected, positioned my practice throught the demands of design in service to a 'client'. I was not taught that design had the potential as a medium for inquiry, but I did have a sense that design was more than a job to fill.

The discipline of design has changed enormously and I have been watching keenly from the sidelines. Design has been building a body of research through practice that bases knowledge from a 'designerly' perspective—expertise that I know I have but barely have the language to put around how it might form the lever to change my practice into the one I was seeking as a design graduate.

After graduation came practice and teaching. It was through teaching that I became more able to explore the potential of the discipline with students and share their experience of becoming designers and all the uncertainty that is attached to that becoming. Becoming a professional and finding that identity that aligns with the values we seek through our work. What we hope to imbibe from design, and the impression we hope to leave through our practice of designing.

Within this inquiry, speculative research uses narratives that challenge the way we think or process realities. The underlying presence of disorientation urges me to create meaningful and lasting changes to my practice. This agitation of practice-led inquiry leads back to itself—

I explored the joints and knots of practice that surfaced through research. This research enabled a shift in how I understand my practice as a process of becoming. A refocusing on the social qualities of designing has led me to believe that design must change from inside practice through learning from outside practice.

This leads to moves that shift the discourse about practice through a deeper reading of what it means to become through social engagement. How might design interact with the social through deeper engagements? How might design be more committed to the social engagement that designing generates? Furthermore, how can this conviction be part of the making designers engage with, and how might this manifest in intuitive and reflective material engagements?

Research, corralled through practice, positions design against deeply challenging future(s) that compels us to imagine profound changes . It leads to the supposition that our societal model must change—and that we need new ways of designing that responds to these urgent needs, including new ways of participating and practicing design that contribute to society in ways that counter the harmful forces of unsustainable activity. Without these changes, design will be very limited in how it develops as a discipline.

This study presents research within the profound possibilities of expanding the capacities of design. However, this study has also found humility in appreciating the limits of designing. Design that focuses on the 'social' tends to make claims as to the agency of designing. Often designing capacity to 'innovate' our way out of problems only creates new ones. This research asks: what does it mean to be a designer with 'social' intentions? How could I learn through designing in ways that engage sites of interdisciplinary social research?

My practice as a graphic designer revealed ways that design is often instrumentalised for the purposes of appearances. Similarly, when a co-design project takes on problems, it readily presents an image of disruptive capacity—of innovative interventions—however, this is seldom accompanied by a meaningful sense of how design commits to this space.

Problems can simply be beyond the capacity of design to bring about meaningful change, yet design is often the last to recognise this …

3.2.2 As If—In-Tension

Bear with me …

The tension between (or in-between) what I felt was expected of me as a 'co-designer' and what was in my gut as effective practice. What worked vs. What looked like it was working. What looked like 'design thinking'.

This tension resides in the familiar relationships that exist in design encounters. Between the client and the designer, between the user and the designer, the designer and the materials, the materials and the collaborators, the participants and the participation. That's it—

The tension between the participants and participation. The human and non-human participants and how the action of participation took us into activated practice. This tension is crucial to how we freight the practice of collaborative creativity.

The tension at the beginning of a workshop when the room is frigid and stiff. A staff meeting room with 5 kg. instant coffee, cheap tea bags and a tin of assorted cream biscuits. A room reserved for painfully professional conversations about how to develop (and better our work and how we can manage each other's expectations and other weaselly conversations).

The room is in itself a tension. You can feel the tension the teachers have with space. The residue of conversations small and big (mostly small). Hardened sachets of sugar substitutes.

These tensions are inherited. I didn't find or locate (or create!) the tensions. They were ready-made and ready to seep into the work that lay before me.

Disrupt the tension? To interrupt this tension seemed to me to be the work that was expected of me. How can I interrupt this room to allow for conversations that shifted the perceptions of possibilities that lay somewhere in those teachers? What was this interruption? It was language. Using their language. Connecting their language to the activity of the workshop.

The excitement that interruption had was audible. It was in the voices of the teachers, in their expressions and the way they played with language. I'm not sure if this felt radical, but perhaps it did for them. It was also visible in expressions and facial communications that we associate with openness and relaxation. The teachers sit in conversation (tensions) with new language (interruption). The language is also in conversation with the teachers.

Being walked to the school gate afterwards—the residual warmth of the teachers' chatter a hearth of common language.

3.2.3 As If — Attention

From being in-tension, a practice of becoming attentive emerges. Ingold reminds us that there can be no knots without knotting (Ingold, 2015, p.18), the emergent outcomes of knotting—a process filled with forces of tension that generate form. As a designer shifting toward practices of greater social acuity, I wonder how the act of knotting might become a way to consider the line of my own practice in-between what it was and what it is becoming.

We might consider this as an education of our attention (Ingold 2015). This relates to how I have approached this study in the activity of attention giving as central to the flow of experimentation. Education, for Ingold, is framed by it's etymological terms; 'educere', which is from ex (out) and ducere (to lead) (Ingold, 2015, p. 178). This is an alternate definition of education that speaks to how we might be led out into the world, rather than have knowledge instilled into us (as is the case in the common use of 'education'). It implies that we might encounter the world, not in the installation of knowledge through 'education', rather, through the drawing out of the learner into the world in order to make the world more 'present' and to discard the 'shields or mirrors that seem to have locked us up increasingly into self-reflections and interpretations" (ibid, 178).

The answer, according to Ingold's reading of education philosopher Jan Masschelein (2010) is 'through exposure'. In this sense 'education' is not about developing a critical distance or perspective; it is leaving a point of view behind and being out-of-position (Masschelein 2010); exposed to a becoming of perspective. This is a deliberate displacement of perspective in order to draw out the imaginative world. In this mode things disclose themselves for what they are, not what we name them to be. We are more alive to their affordances. The more we practice being out-of-position perhaps the better we get at noticing and responding to our environment as it is. This is, for Ingold, an education of attention—attention is to a world that is immanent—a world that is becoming and in a state of continual emergence.

I'm searching for a practice that is attentive to how it learns as it develops ...

Attuning to what situations tell us can be understood as 'attuning'. Attuning to smell, sounds, shapes ... it's like listening with your body (Duff et al. 2017). Attuning relates to design as it is turning into how the decisions made by the designers has led to entanglements. Design leads to our experience of the world. Design shapes that experience. But how can we better understand it? We can attune to the space that we're investigating as researchers ...

To join the recollection of action as an active participant in the formation of practice-led knowing. A knowing that forms as it unfolds ...

3.3 Conclusion: Joining Research Practice

This study is framed by the question: How might design practice join ways of becoming with collaborative research? In response, practice-led research has revealed a deeper understanding of how design might shift—or *become*—with collaborative research engaging through creative analytical frameworks; a study of how we might form better knowledge around coming-together with research through practice. Specifically, the methodological inquiry of 'joining' is named as a significant contribution to how we might approach a sense-making framework that emerges from sites of collaborative practice-led research.

Joining has been developed as a practice of data analysis that allows designers to become productively disorientated within the data, reframing the potential of how we might understand a practice of co-design research as a mode of transformative learning. A meshwork of speculative experiments responded to the methodological dilemmas that provoked an integration of old (graphic design) expertise with new emergent (collaborative design) sense-making skills. This led to an ongoing transformation from practitioner to researcher. The concluding chapter of this thesis will outline the significance of the methodological inquiry at the heart of this research, and how this has revealed knowledge that is transferable beyond this doctoral study.

3.3.1 Significance & Contribution to Knowledge

Methodological Inquiry: Joining as Enabling

The contribution of this study is identified in the significance of a methodological inquiry emerging at the site of data analysis. The ILETC program-led 'Regional Workshops' formed a significant primer for the central project of this study: Making Space. This practice-led research project engaged with teacher practitioners as participants through a series of co-design workshops—fabricating ideas from deep within the interpretive mesh-work of designerly sense-making. It was within that mesh-work I began conceptualising, joining, a term adapted from the methods of Participant Observation. The additional narratives—the 'practice proofs'—carry significance from within this mesh-work. These 'proofs' have been exploring the worlds that have enabled this research to come into being. From my antecedent practice as a graphic designer alongside training and research as a teacher, the 'proofs' that emerge describe the becoming that can contribute to an ongoing conversation with my practice, and shifting design practices

Data analysis from Making Space developed joining as a speculative method of intentional curiosity that attends to how the affective texture of creative collaboration evokes a sense of becoming with data through a practice approach to methodological inquiry. I argue that this joining—an emergent and speculative mode—amplifies our capacity to imagine relationality at the centre of design research. Analysis of project data reveals that the relationship a designer creates within collaborative research can be imagined through modes of designerly methods. Furthermore, an exploration of speculative joining as an analytical framework was framed through theories of practice, contributing to the methodological inquiry. Examination through practice theory locates a sense of an active relationship with the real world we inhabit (Althusser 2018, p.44). The formation of practice in turn implies an active forming of the practitioner as an agent of learning and becoming.

This is significant for co-design practice seeking to examine outcomes from collaborative research in order to broaden knowledge around emergent practices. When data resulting from co-design workshops are examined, analytical frameworks are often supplanted from outside of practice research. I argue that to make sense of the sense-making that design engages with, analytical frameworks must emerge from within the affective fabric of design practice. This study identifies the significance of this for design researchers seeking to develop connective methodologies that locate designs' contribution to sense-making within collaborative research.

Engaging with a Whole Practice

This practice-led research adapted Steen's (2013) use of 'co-design', derived from Sanders and Sappers "collective creativity as it is applied across the whole span of a design process"(Sanders & Stappers, 2008, p.5-18). My reading of "the whole span of a design process" equates to joining a practice that is made 'whole' by better understanding the learning processes that co-design engages with. This research posits that a better understanding of these process leads to a 'whole' design practice—one that responds to the 'social turn' that has re-imagined how we might appreciate design's contribution to society. The contributions of this research, in turn, develops methodological frameworks for designers shifting to a co-design practice that seek to build this critical capacity to better join social practices as a site of learning and becoming. This contribution recognises an opportunity to study how design can develop a whole picture of practice in interdisciplinary research settings. In this study, joining entails relational shifts from design in service to a program; to the emergence of the designer-as-researcher within a project—joining practice from within. These shifts open up relational tensions that afford opportunities for creative exploration and experimentation—a slow practice of generative becoming within in order to become whole.

Beyond being a problem-solving agent, the designer builds a practice that is formed between a dialectical process of designing projects, and the project of becoming a designer (Willis 2019, p.54). Building a sense of self as a designer can be a bewildering process that reveals how design knowing is a process of 'conscious not-knowing' (Nelson and Stolterman 2012). Opportunities for learning occur through the inherent disorientation of this practice of not-knowing; this argues that engaging with data from within this state can be one of productive disorientation that creates speculative analytical frameworks. The research describes this state as a 'knot' that shifts practice toward a speculative 'knot-knowing'—toward a whole practice—through a mode of transformative learning.

Experimentation is also key to appreciating this shift. This study argues that joining practice-led research data leads to a richer interaction with design practice through creative experimentation. This reveals how design practice might be situated in collaborative research, promoting the possibilities of transformation for designers seeking to expand their practice. A deeper engagement with practice indicates the contribution of this speculative mode of inquiry makes through the research—this is evidenced in the shifts this research project has created for the researcher. These shifts move the speculative analysis situated within the collaborative research program. 'Moves' that have exerted a disorientating force over my practice. I argue that: designing with others requires becoming with practice—that design must learn to join itself as an act of transformative learning.

3.3.2 Transferability and Further Opportunities

Joining as Transformative Learning

Transformative Learning (TL) is described as "a deep, structural shift in basic premises of thought, feelings, and actions. It is a shift of consciousness that dramatically and permanently alters our way of being in the world" (Transformative Learning Centre 2016, in Yee et al. 2019, p111). The notion of a 'paradigm shift' by Thomas Kuhn (Watson 1966) has been significant for the development of TL. A paradigm shift occurs when we experience our assumptions and expectations—indeed all our tacit beliefs and actions—challenged through reflection and action (Kuhn, 1966). TL challenges our thinking, feeling, and acting, which in turn shifts and restructures our 'meaning perspective' (Illeris 2009). TL engages with both instrumental and communicative learning (Habermas 1984). The potential transferability of this research is in how communicative learning (which involves a dialogic analogous to a design process) is present in the joining explored in this study. It is communicative learning that focuses on conversations that occur as part of a transformational process. This is a complex process that enrols an analogical-abductive process. The method of joining might be transferable to research that engages with analogical-abductive reasoning, where the use of creative modelling requires methods that enable creative reasoning as a way to process complex ideas. Both analogous and abductive processes inherent to TL are equally significant to this thesis through the theoretical inquiry of joining.

Joining as Shifting

Joining aligns with the processes of TL that seek to shift problematic perspectives—and the inherent assumptions or expectations that accompany them—opening the learner to the possibilities of reflection and change. This doctoral research project was seeking ways to develop a practice from being in service to the programming of design to learning how to better understand practice shifts through design research. I describe this as becoming practice—a mode of transformative learning that involves validating and reformulating meaning structures, revealing beliefs through a process of participating in them in a free and open way that is in dialogue with a critical interrogation of data.

Such a transformation may be sudden, often brought on by the necessary resolution of a crisis. Or it might be more cumulative through a slower progression of insights that shift us toward transformation. This research seeks to scaffold a formative and cumulative progression. Joining, as an approach to data analysis, allows space and time for the emergence of meaning to form as the analogic-abductive process of inquiry unfolds. Harnessing this developmental logic is recognised in this study as a transferable approach to transformative learning. Joining, it is argued, holds the potential to engage with processes of abductive-analogy through creative practice. The data, in this case, might be considered as practice, as the engagement with data is one that activates a creative practice of knowledge building.

Joining for Social Impact

This study names a process of becoming—of transformational learning—in order to articulate processes that contribute to how design emerges as a social practice with a unique impact. This identifies the possibilities of joining being transferred to the study of design's social impact. I argue that a better understanding of the transformative potential of joining as a mode of learning might lead to a more articulate and complete appreciation of how we evaluate the social impact of co-design. The role of social impact in design is increasingly recognised as having significant value. However much work is to be done to develop how we evaluate this 'impact'. Currently, evaluation uses 'positivistic economic model of cause and effect, making it challenging to capture the range of multi-dimensional impacts that emerge in social innovation projects" (Yee et al. 2019, p. 112).

Joining a Whole Practice

Through TL, practice-led research has expressed emotional learning, seeking to create a holistic expression and conscious practice of becoming (Dirkx 1998). Understood through a transformative learning lens, this doctoral research is a process of critical reflection that has challenged my beliefs and assumptions leading to shifts in perspective and understanding. This framework resonates with the methodological inquiry revealed in this research analysis: practice has led to shifts in how design has moved from being in service to the program (ILETC) to learning with the project (Making Space). Joining created a sense of a whole practice. Methods of joining helped me shift from being with the data to becoming with the data. A shift toward becoming a researcher of and through practice.

Opportunities for Further Research

The outcomes of this research present opportunities for further study into how we might learn as designers with communities of practice that join a co-design process of collaborative inquiry. This might be studied as learning with communities undergoing transformational change. Other opportunities identify how we might transfer methods that emerged from this research back to participants to co-create with data in order to co-produce knowledge. This might engage a Participatory Action Research (PAR) methodology alongside the practice of co-design to fold participation back into the sense-making of data described as joining. Using these methods with participants holds the potential to develop the notion of joining into critical PAR approaches. This was limited in the research project due to how little time teacher-participants had available for Making Space. The potential process of co-analysis presents an opportunity that extends the outcomes of this study into collaborative practices of data analysis. A practice that will continue into the researcher's post-doctoral practice-led research.

The invention of BiTs as a method for analysis might also be expanded across multiple sites and beyond video capture. The form of the BiT might also take on digital qualities making it possible to interact over distance using screen-based media. This has been a significant reflection at the time of submission, COVID-19 having a significant impact on how we work and interact across practices. Opportunities might exist in developing BiTs as an online instrument enabling participatory and collaborative research to continue.

Together/Alone; With-in/With-out

In concluding this study, speculation has led toward possible frameworks emerging from the knots engaged in research. To reiterate; 'Joining' began within this research, with teachers engaging with co-design practice. I joined them as a co-facilitator of designerly encounters that drew them together to 'make' conversations they wanted to have about their practice.

> *Joining led me to my practice.*

Joining led to questions about how I learn from a practice of design that is shifting, and how I do this through collaborative research. It led through PO, via PAR, and revealed to me how 'joining' was a method of PO that could be extended into a practice of design that was seeking to locate the shifts that felt destabilising and disorientating. I had naturally resisted this disorientation for some time, trying to make sense of the changes occurring to design practice. Changes occurring to all our practices are significant, and respond to the enormous challenges we face as a community facing disruption and disorder to our lives as systems and structures respond to urgent needs to restructure how we live, how we work, and how we learn from practice.

I create a mode of 'joining' that emerges from within the disorientation that shapes practice. 'Joining' is located within disorientated practice. This joining is within, and without, practice. There is joining that occurs with-in the 'project' of the 'designer-self', and there is joining that occurs with-out the 'project' of collaborative design—through collaboration.

A speculative framework arrives at the conclusion of this research project. This invites further research that engages with the findings of the project. The outcomes of 'joining' might now lead back to the participants and how we 'join', again, as a sense-making process of discovery. For teachers this might be taking the data that emerged from the workshops and stamp, hang and draw on the data. They could go with-in, through making, and come back out again to join up what reflections emerged through 'joining' the research process. This guides a practice of joining that is about seeing a whole practice. Joining instructs the practitioner to look at a whole practice—doing together, reflecting alone, the visible practices, the invisible moves—how we activate our sense of becoming. These ideas will be taken into collaborative research in a post-doctorate context. 'Making Space' is alive in continuing contributions to how teachers make—together—the potential of their innate capacity to learn as agents of practice transformation.

3.3.3 Proof of a Knot ...

This practice-led research began in a knot—

Actually, it was inspired by a knot. I found my historical practice of graphic design shifting toward a practice that appreciates the socially embedded nature of design—a shift toward a social design practice. This led me to ask: how can I better know the evolving state of my own design practice? I sensed my practice becoming something else, and this collaborative research has enabled an inquiry into that 'something else'. My practice has evolved through research that has situated a process of becoming—a mode of transformational learning.

The disorientation of an evolving practice directed a line of inquiry that asked: How might I join practice-led research in order to shift my design practice? In response, answers to this question emerge through speculative joining—a significant conceptual and practical moment within the study—that framed methods activating the 'disorienting dilemma' of an evolving practice paradigm. This, I argue, is a state of transformation—a new paradigm of designing that is situated by the data through the practice of joining. Joining became a mode of transformative learning as it responded to the disorienting dilemma of becoming a researcher through complex collaborative inquiry.

Collaborative research afforded an opportunity to install a co-design project within the program to ground the practice-led research (Findeli 2010). Joining the PAR study was significant as I developed the method of joining by way of Participant Observation (PO) and began to frame data analysis using a PO augmented by practice—a speculative joining. The project within the program allowed me to gather data from participants collaborating on a PAR study designed to elicit data through collaborative workshops. Speculative joining developed an experimental mode of data analysis in order to better inhabit processes of sense-making. I speculate using experimental sense-making methods that reflect the affective qualities of designerly-led analysis. Joining, in the context of this study, becomes a move toward designerly analysis. An analytical move—within a practice framework of sense-making—that seeks to inhabit deliberate disorientation in order to engage a richer emergence of meaning. For me, this is a shift from being a graphic designer to becoming a collaborative design researcher. Joining has helped me to make sense of this shift. 'Joining' is my research practice seeking to gather knowledge through a sense of the exquisite disorientation that continues to kindle the enduring conditions of becoming a designer.

This PhD felt like a proof of design's transformative potential—

I'm drawn to the proof as a metonym for possibility. It's an instrument of calibration, of process control and accountability—it contains what is. However, it's also an artefact of the possible—the processual 'as if' of designing. I continue to search for proofs of that liminal space of becoming through design research ...

Bibliography

Agamben, Giorgio. 1998. *Sovereign Power and Bare Life*. Stanford, California: Stanford University Press.

Allen, Felicity, ed. 2011. *Education*. Cambridge, Massachusetts: The MIT Press.

Althusser, Louis. 2017. *Philosophy for non-philosophers*. London: Bloomsbury Academic.

Althusser, Louis. 2018. 'What Is Practice?' Pp. 44–48 in *Practice*, *Whitechapel: Documents of contemporary art*, edited by G. Levine and M. Boon. Whitechapel Gallery.

Argyris, Chris, and Donald A. Schön. 1978. *Organizational Learning*. Reading, Massachusetts: Addison-Wesley Publishing.

Bakhtin, M. M. 1981. *The Dialogic Imagination: Four Essays*. edited by M. Holquist. Austin, Texas: University of Texas Press.

Balskus, Elizabeth. 2010. 'Examining Potentiality in the Philosophy of Giorgio Agamben'. *Macalester Journal of Philosophy* 19(1).

Barone, Tom, and Elliot W. Eisner. 2012. *Arts Based Research*. Los Angeles: SAGE.

Barry, Andrew, Georgina Born, and Gisa Weszkalnys. 2008. 'Logics of Interdisciplinarity'. *Economy and Society* 37(1):20–49. doi: 10.1080/03085140701760841.

Benade, Leon, and Mark Jackson, eds. 2018. *Transforming Education*. Singapore: Springer Singapore.

Biggs, Michael, Henrik Karlsson, and Riksbankens jubileumsfond, eds. 2011. *The Routledge Companion to Research in the Arts*. Abingdon, Oxon: Routledge.

Binder, Thomas, and Eva Brandt. 2017. 'Design (Research) Practice'. Pp. 101–11 in *Practice based design research*, edited by L. Vaughan. London: Bloomsbury Academic.

Bishop, Claire, ed. 2006. *Participation*. Cambridge, Massachusetts: The MIT Press.

Björgvinsson, E., P. Ehn, and P. Hillgren. 2012. 'Design Things and Design Thinking: Contemporary Participatory Design Challenges'. *Design Issues* 28(3).

Bochner, Arthur P. 2001. 'Narrative's Virtues'. *Qualitative Inquiry* 7(2):131–57.

Boelen, Jan, Jonas Althaus, and Elke Stevens. 2020. *Social Matter, Social Design: For Good or Bad, All Design Is Social*. Amsterdam: Valiz.

Boon, Marcus, and Gabriel Levine, eds. 2018. *Practice*. Cambridge, MA: The MIT Press.

Bowen, Simon, Abigail Durrant, Bettina Nissen, John Bowers, and Peter Wright. 2016. 'The Value of Designers' Creative Practice within Complex Collaborations'. *Design Studies* 46. doi: 10.1016/j.destud.2016.06.001.

Brandt, E., J. Redström, M. A. Eriksen, and T. Binder. 2011. *XLAB*. Denmark: The Danish Design School Press.

Brown, T. 1986. 'Design Thinking'. *Havard Business Review*.

Brown, Tim. 2008. 'Design Thinking'. *Harvard Business Review*, June 1.

Bruscaglioni, Livia. 2016. 'Theorizing in Grounded Theory and Creative Abduction'. *Quality and Quantity*. doi: 10.1007/s11135-015-0248-3.

Bueger, Christian, and Frank Gadinger. 2018. *International Practice Theory*. 2nd ed. Palgrave Macmillan.

Burr, Vivien. 2003. *Social Constructionism*. 2nd ed. London ; New York: Routledge.

Burr, Vivien. 2006. *An Introduction to Social Constructionism*. London: Taylor & Francis.

Candy, Linda. 2006. *Practice Based Research: A Guide. Report*. V1.0. Sydney: University of Technology.

Carson, Timothy, ed. 2019. *Neither Here nor There: The Many Voices of Liminality*. 1st ed. Lutterworth Press.

Chow, Rosan W. Y., Wolfgang Jonas, and Gesche Joost, eds. 2010. *Questions, Hypotheses & Conjectures: Discussions on Projects by Early Stage and Senior Design Researches*. New York: iUniverse Inc.

Clandinin, D. Jean, and F. Michael Connelly. 2000. *Narrative Inquiry: Experience and Story in Qualitative Research*. 1st ed. San Francisco: Jossey-Bass Publishers.

Cole, Ardra L., and J. Gary Knowles. 2000. *Researching Teaching: Exploring Teacher Development through Reflexive Inquiry*. Boston: Allyn and Bacon.

Connelly, Michael, and Jean Clandinin. 1990. 'Stories of Experience and Narrative Inquiry'. Pp. 2–14 in *Fotocopia de: Educational Researcher*. Vol. 5.

Cross, Nigel. 2006. *Designerly Ways of Knowing*. Germany: Springer.

Crotty, Michael. 2020. *The Foundations of Social Research: Meaning and Perspective in the Research Process*. Ebook. London: Routledge.

Csikszentmihalyi, Mihaly. 2009. *Flow: The Psychology of Optimal Experience*. Ebook. New York: HarperCollins e-books.

Daloz, Laurent A., and Laurent A. Daloz. 1999. *Mentor: Guiding the Journey of Adult Learners*. San Francisco: Jossey-Bass.

Deleuze, Gilles, and Félix Guattari. 2013. *A Thousand Plateaus: Capitalism and Schizophrenia*. London: Bloomsbury Academic.

Denzin, Norman K., and Yvonna S. Lincoln, eds. 1994. *Handbook of Qualitative Research*. Thousand Oaks: Sage Publications.

Denzin, Norman K., and Yvonna S. Lincoln, eds. 2005. *The SAGE Handbook of Qualitative Research*. 3rd ed. Thousand Oaks: Sage Publications.

de Oliveira, Pedro J. S. Vieira. 2016. 'Design at the Earview: Decolonizing Speculative Design through Sonic Fiction'. Design Issues 32(2):43–52.

DeWalt, Kathleen M., Billie R. DeWalt, and Coral B. Wayland. 1998. 'Participant Observation'. Pp. 259–99 in *Handbook of methods in cultural anthropology*, edited by H. R. Bernard.

Dewey, John. 1929. *The Quest for Certainty*. New York: Minton, Balch & Co.

Dewey, John. 1962. *Experience and Nature: The Paul Carus Lectures, First Series, 1925*. La Salle, Ill.: Open Court.

Dewey, John. 2008. *The Later Works, 1925 - 1953 1929: The Quest for Certainty*. Vol. 4. edited by H. F. Simon, S. E. Toulmin, and J. A. Boydston. Carbondale: Southern Illinois University Press.

Dewey, John, Joseph Ratner, and Edward A. Post. 1939. *Intelligence in the Modern World: John Dewey's Philosophy*. New York: Modern Library.

Dirkx, J. 1998. 'Transformative Learning Theory in the Practice of Adult Education: An Overview.'

Dorst, Kees. 2011. 'The Core of "Design Thinking" and Its Application'. *Design Studies* 32(6):521–32.

Dorst, Kees. 2015. *Frame Innovation: Create New Thinking by Design*. The MIT Press.

Duff, Cameron, and Shanti Sumartojo. 2017. 'Assemblages of Creativity: Material Practices in the Creative Economy'. *Organization* 24(3):418–32.

Dunne, Anthony, and Fiona Raby. 2013. *Speculative Everything: Design, Fiction and Social Dreaming*. The MIT Press.

Durrant, Abigail C., John Vines, Jayne Wallace, and Joyce S. R. Yee. 2017. 'Research Through Design: Twenty-First Century Makers and Materialities'. *Design Issues* 33(3):3–10.

Dweck, Carol. 2017. *Mindset: Changing the Way You Think to Fulfil Your Potential*. Updated. London: Robinson.

Dwyer, Claire, and Gail Davies. 2010. 'Qualitative Methods III: Animating Archives, Artful Interventions and Online Environments'. *Progress in Human Geography* 34(1):88–97.

Escobar, Arturo. 1995. *Encountering Development: The Making and Unmaking of the Third World*. Princeton, N.J: Princeton University Press.

Escobar, Arturo. 2018. *Designs for the Pluriverse: Radical Interdependence, Autonomy, and the Making of Worlds*. Durham: Duke University Press.

Fensham, Rachel, and Alexandra Heller-Nicholas. 2018. 'Making and Assembling'. Pp. 29–40 in *Routledge handbook of interdisciplinary research methods*, edited by C. Lury, R. Fensham, A. Heller-Nicholas, S. Lammes, A. Last, M. Michael, and E. Uprichard. Abingdon, Oxon: Routledge.

Findeli, Alain. 1998. 'A Quest for Credibility: Doctoral Education and Research in Design at the University of Montreal'. Ohio.

Findeli, Alain. 2001. 'Rethinking Design Education for the 21st Century: Theoretical, Methodologial, and Ethical Discussion'. *Design Issues* 17(1): 5–17.

Findeli, Alain. 2010. 'Searching for Design Research Questions: Some Conceptual Clarifcations'. Pp. 286–302 in *Questions, hypotheses and conjectures: Discussions on projects by early stage and senior design researchers*, edited by R. W. Y. Chow, W. Jonas, and G. Joost. New York: iUniverse Inc.

Findeli, Alain. 2016. 'Rethinking Design Education for the 21st Century : Theoretical , Methodological , and Ethical Discussion'. *Design Issues*.

Friedman, Ken. 2003. 'Theory Construction in Design Research: Criteria; Approaches, and Methods'. *Design Studies* 24(6):507–22.

Friedman, Michael, and Wolfgang Schäffner, eds. 2016. *On Folding: Towards a New Field of Interdisciplinary Research*. Bielefeld: transcript.

Gaver, William. 2012. 'What Should We Expect from Research through Design?' in *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems*. New York: ACM.

Geuss, Raymond. 1981. *The Idea of a Critical Theory: Habermas and the Frankfurt School*. Cambridge UK: Cambridge University Press.

Glaser, Barnery, and Anselm Strauss. 1967. *The Discovery of Grounded Theory: Strategies for Qualitative Research*. New York: Aldine.

Greig, Andrew. 2010. *At the Loch of the Green Corrie*. London: Quercus.

Grocott, Lisa, Kate McEntee, Kathryn Coleman, and Roger Manix. 2019. 'The Becoming of a Designer: An Affective Pedagogical Approach to Modelling and Scaffolding Risk-Taking'. *Art, Design & Communication in Higher Education* 18(1):99–112.

Habermas, Jürgen. 1984. *The Theory of Communicative Action*. Boston: Beacon Press.

Halse, Joachim, ed. 2010. *Rehearsing the Future*. Copenhagen: The Danish Design School Press.

Haynes, Steven R., and John M. Carroll. 2007. 'Theoretical Design Science in Human–Computer Interaction: A Practical Concern?' *Artifact* 1(3):159–71.

Herman, David. 2012. *Narrative Theory: Core Concepts and Critical Debates*. The Ohio State University Press.

Hesse-Biber, Sharlene Nagy, and Patricia Leavy, eds. 2008. *Handbook of Emergent Methods*. New York: Guilford Press.

Illeris, Knud. 2009. 'Contemporary Theories of Learning : Learning Theorists -- in Their Own Words'. *Learning*.

Imms, Wesley, Benjamin Cleveland, and Kenn Fisher. 2016. *Evaluating Learning Environments: Snapshots of Emerging Issues, Methods and Knowledge*. Rotterdam: SensePublishers.

Ingold, Tim. 2011. *Being Alive: Essays on Movement, Knowledge and Description*. London ; New York: Routledge.

Ingold, Tim. 2015. *The Life of Lines*. London: Routledge.

Jellis, Thomas. 2018. 'Experimenting'. Pp. 77–80 in *Routledge handbook of interdisciplinary research methods*, edited by C. Lury, A. Heller-Nicholas, S. Lammes, A. Last, M. Michael, and E. Uprichard. Abingdon, Oxon: Routledge.

Jonas, Wolfgang, Sarah Zerwas, and Kristof von Anshelm, eds. 2016. *Transformation Design: Perspectives on a New Design Attitude*. Basel: Birkhauser Verlag GmbH.

Jones, John Chris. 1970. *Design Methods*. Chichester, UK: Wiley.

Joost, Gesche, Katharina Bredies, Michelle Christensen, Florian Conradi, and Andreas Unteidig, eds. 2016. *Design as Research: Positions, Arguments, Perspectives*. Basel: Birkhäuser.

Jupp, Victor, ed. 2006. *The SAGE Dictionary of Social and Cultural Research Methods*. London: SAGE.

Kawulich, Barbara. 2005. 'Participant Observation as a Data Collection Method'. *Forum: Qualitative Social Research* 6(2).

Kemmis, Stephen, Jane Wilkinson, Christine Edwards-Groves, Ian Hardy, Peter Grootenboer, and Laurette Bristol. 2014. *Changing Practices, Changing Education*. Singapore: Springer Singapore.

Kimbell, Lucy. 2009. 'Beyond Design Thinking: Design-as-Practice and Designs-in-Practice'. Pp. 15–15 in. Manchester.

Klein Julie Thompson, author. 2015. *Interdisciplining Digital Humanities: Boundary Work in an Emerging Field*. University of Michigan Press.

Knorr Cetina, Karin, Theodore R. Schatzki, Eike von Savigny, and K. Knorr-Cetina. 2005. *The Practice Turn in Contemporary Theory.*

Kohli, Rita, Bree Picower, Antonio Martinez, and Natalia Oritz. 2015. 'Critical Professional Development: Centering the Social Justice Needs of Teachers'. *International Journal of Critical Pedagogy* 6(2):7–24.

Kolko, Jon. 2010a. 'Abductive Thinking and Sensemaking: The Drivers of Design Synthesis'. *Design Issues* 26(1):15–28. doi: 10.1162/desi.2010.26.1.15.

Kolko, Jon. 2010b. 'Sensemaking and Framing: A Theoretical Reflection on Perspective in Design Synthesis'. Pp. 1–9 in *2010 Design Research Society Conference*. Montreal, Canada.

Kolko, Jon. 2011a. 'Craftsmanship'. *Interactions* 18(6):78–81.

Kolko, Jon. 2011b. 'Unveiling the Magic of Design: The Role of Synthesis'. *Rotman Management Magazine*, 53–57.

Kolko, Jon. 2015. 'Design Thinking Comes of Age'. *Harvard Business Review*.

Koskinen, Ilpo, and Peter Gall Krogh. 2015. 'Design Accountability: When Design Research Entangles Theory and Practice'. *International Journal of Design* 9(1).

Kurtz, Cynthia, and David Snowden. 2003. 'The New Dynamics of Strategy: Sense-Making in a Complex and Complicated World'. *IBM Systems Journal* 42(3).

Lackney, J. A. 2008. 'Teacher Environmental Competence in Elementary School Environments'. *Children Youth and Environments* 18(2):133–59.

Laros, Anna, Thomas Fuhr, and Edward W. Taylor, eds. 2017. *Transformative Learning Meets Bildung: An International Exchange*. Vol. 21. Rotterdam: Sense Publishers.

Lawson, Bryan. 1990. *How Designers Think*. 2nd ed. London: Butterworth Architecture.

Lévi-Strauss, Claude. 1966. *The Savage Mind.* Chicago: University of Chicago Press.

Lieblich, Amia, Rivka Tuval-Mashiach, and Tamar Zilber. 1998. *Narrative Research: Reading, Analysis and Interpretation*. Thousand Oaks, CA: Sage Publications.

Lippmann, Walter. 1922. *Public Opinion*. United States? Greenbook Publications.

Lloyd, Peter. 2019. 'You Make It and You Try It out: Seeds of Design Discipline Futures'. *Design Studies* 65:167–81. doi: 10.1016/j.destud.2019.10.008.

Lloyd, Peter, and Arlene Oak. 2018. 'Cracking Open Co-Creation: Categories, Stories, and Value Tension in a Collaborative Design Process'. *Design Studies* 57:93–111.

Lury, Celia, ed. 2018. *Routledge Handbook of Interdisciplinary Research Methods*. Abingdon, Oxon ; New York, NY: Routledge.

MacIntyre, D. 1993. 'Theory, Theorising, and Reflection in Initial Teacher Education'. Pp. 11–22 in *Conceptualising Reflection in Teacher Development*. London: Falmer Press.

Mahat, M., L. Grocott, and W. Imms. 2017. *"In the Real World...": Teachers' Perceptions of ILEs*. *Technical report*. 2/2017. Innovative Learning Environments & Teacher Change (ILETC).

Manzini, Ezio. 2015. *Design, When Everybody Designs: An Introduction to Design for Social Innovation*.

Mareis, Claudia. 2016. 'Doing Research: Design Research in the Context of the "Practice Turn"'. Pp. 35–41 in *Design as research: Positions, arguments, perspectives*, edited by G. Joost, K. Bredies, M. Christensen, F. Conradi, and A. Unteidig. Basel: Birkhäuser.

Markauskaite, Lina, Peter Freebody, and Jude Irwin, eds. 2010. *Methodological Choice and Design: Scholarship, Policy and Practice in Social and Educational Research*. 1. ed. Dordrecht: Springer.

Markussen, Thomas. 2017. 'Building Theory through Design'. Pp. 87–100 in *Practice based design research*, edited by L. Vaughan. London: Bloomsbury Academic.

Martin, Roger L. 2009. *The Design of Business*. Boston, Mass: Harvad Business Press.

Mason, John. 2002. *Researching Your Own Practice: The Discipline of Noticing*. London & New York: Routledge.

Masschelein, J. 2010. 'The Idea of Critical E-Ducational Research—e-Ducating the Gaze and Inviting to Go Walking'. Pp. 275–91 in *The Possibility/Impossibility of a New Critical Langauge of Education*. Rotterdam: Sense Publishers.

Merriam, Sharan B., and M. Carolyn Clark. 1991. *Lifelines: Patterns of Work, Love, and Learning in Adulthood*. 1st ed. San Francisco: Jossey-Bass.

Mezirow, Jack. 1990. *Fostering Critical Reflection in Adulthood: A Guide to Transformative and Emancipatory Learning*. 1st ed. San Francisco: Jossey-Bass Publishers.

Mezirow, Jack. 2000. *Learning as Transformation: Critical Perspectives on a Theory in Progress*. 1st ed. San Francisco: Jossey-Bass.

Michael, Mike. 2018. 'Compromising'. Pp. 279–83 in *Routledge handbook of interdisciplinary research methods*, edited by C. Lury, R. Fensham, A. Heller-Nicholas, S. Lammes, A. Last, M. Michael, and E. Uprichard. Abingdon, Oxon: Routledge.

Michael, Mike, and Alex Wilkie. 2020. 'Speculative Research'. Pp. 1–8 in *The Palgrave encyclopedia of the possible*, edited by S. Agnoli, R. Anderson, S. Bourgeois-Bougrine, M. Cabra, A. Chirico, G. F. C. de Macêdo, H. Hawlina, I. Lebuda, S. Mastria, I. J. Ness, C. Nicholson, R. Randell, W. Ross, and R. Tau. Cham: Springer International Publishing.

Murphy, Peter. 2017. 'Design Research: Aesthetic Epistemology and Explanatory Knowledge'. *She Ji: The Journal of Design, Economics, and Innovation* 3(2):117–32.

Nelson, Harold G., and Erik Stolterman. 2012. *The Design Way: Intentional Change in an Unpredictable World*. Second edition. Cambridge, Massachusestts ; London, England: The MIT Press.

Noddings, Nel. 1986. 'Fidelity in Teaching, Teacher Education, and Research for Teaching'. *Harvard Educational Review* 56(4):496–511. doi: 10.17763/haer.56.4.34738r7783h58050.

Nohl, Arnd-Michael. 2015. 'Typical Phases of Transformative Learning: A Practice-Based Model'. *Adult Education Quarterly* 65(1):35–49.

Ó Tuama, Pádraig. n.d. 'Published Poetry and Prose'. *In the Shelter*. Retrieved 4 December 2020 (http://www.padraigotuama.com/published-poetry).

Oak, Arlene, and Peter Lloyd. 2016. '"Throw One out That's Problematic": Performing Authority and Affiliation in Design Education'. *CoDesign* 12(1–2):55–72.

Oliver, James, ed. 2018. *Associations: Creative Practice and Research*. Carlton, Victoria, Australia: Melbourne University Press.

Olson, John. 1992. *Understanding Teaching: Beyond Expertise*. Milton Keynes ; Philadelphia: Open University Press.

Pahl, Gerhard, and Wolfgang Beitz. 2007. 'UNSURE'. in *Pahl/Beitz konstruktionslehre*, edited by J. Grote and K.-H. Feldhusen.

Paniagua, Alejandro, and David Istance. 2018. *Teachers as Designers of Learning Environments: The Importance of Innovative Pedagogies*. *Report*. Paris: OECD Publishing.

Paton, Bec, and Kees Dorst. 2011. 'Briefing and Reframing: A Situated Practice'. *Design Studies* 32(6):573–87.

Peirce, C. S. 1903.'Lecture VI'. Presented at the Harvard Lectures on Pragmatism, Harvard University.

Peterson, Penelope, Eva Baker, and Barry McGaw, eds. 2010. *International Encyclopedia of Education*. Amsterdam: Elsevier Science.

Phillips, Andrea. 2018. 'From Work to Practice'. Pp. 71–73 in *Practice*, *Whitechapel: Documents of contemporary art*, edited by G. Levine and M. Boon. Whitechapel Gallery.

Pink, Sarah. 2009. *Doing Sensory Ethnography*. Sage Publications.

Pink, Sarah, Yoko Akama, and Shanti Sumartojo. 2018. Uncertainty and Possibility: New Approaches to Future Making in Design Anthropology. 1st edition. New York, NY: Bloomsbury Academic, an imprint of Bloomsbury Publishing Plc.

Plattner, Hasso, Christoph Meinel, and Larry Leifer. 2015. *Design Thinking Research: Making Design Thinking Foundational*. Springer.

Plummer, Kenneth. 2001. *Documents of Life*. London: SAGE.

Reckwitz, Andreas. 2002. 'Towards a Theory of Social Practices: A Development in Cultural Theorizing'. *European Journal of Social Theory* 5(2):243–64.

Redström, Johan. 2017. *Making Design Theory*. Cambridge, Massachusetts: The MIT Press.

Reichertz, Jo. 2009. 'Abduction: The Logic of Discovery of Grounded Theory'. *Forum Qualitative Sozialforschung [Forum: Qualitative Social Research]* 11(1):Art 13.

Riessman, Catherine Kohler. 1990. *Divorce Talk: Women and Men Make Sense of Personal Relationships*. New Brunswick: Rutgers University Press.

Rittel, H. W. J., and M. M. Webber. 1973. 'Dilemmas in a General Theory of Planning'. *Policy Sciences* 4:155–69.

Rodgers, P., and J. Yee. 2014. *The Routledge Companion to Design Research*. Vol. 48.

Rodgers, Paul A., and Joyce Yee, eds. 2015. *The Routledge Companion to Design Research*. New York: Routledge, Taylor & Francis Group.

Rogoff, Irit. 2000. *Terra Infirma: Geography's Visual Culture*. London ; New York: Routledge.

Rogoff, Irit. 2014. 'The Expanding Field'. *Yishu Journal of Contemporary Chinese Art* 13(2):12–19.

Royalty, Adam, and Bernard Roth. 2016. 'Developing Design Thinking Metrics as a Driver of Creative Innovation'. Pp. 171–86 in *Design thinking research: Making design thinking foundational*, *Understanding Innovation*, edited by H. Plattner, C. Meinel, and L. Leifer. Cham: Springer International Publishing.

Sanders, Elizabeth B. N., and Pieter Jan Stappers. 2008. 'Co-Creation and the New Landscapes of Design'. *CoDesign* 4(1):5–18.

Sanders, Liz, and Pieter Jan Stappers. 2012. *Convivial Design Toolbox: Generative Research for the Front End of Design*. Vol. 61. Laurence King Publishing.

Sanders, Liz, and Pieter Jan Stappers. 2014. 'From Designing to Co-Designing to Collective Dreaming'. *Interactions* 21(6). doi: 10.1145/2670616.

Schatzki, Theodore R. 2002. *The Site of the Social: A Philosophical Account of the Constitution of Social Life and Change*. University Park: Pennsylvania State University Press.

Schatzki, Theodore R., K. Knorr-Cetina, and Eike von Savigny, eds. 2001. *The Practice Turn in Contemporary Theory*. New York: Routledge.

Schensul, Stephen L., Jean J. Schensul, and Margaret Diane LeCompte. 1999. *Essential Ethnographic Methods: Observations, Interviews, and Questionnaires*. Walnut Creek, CA: AltaMira Press.

Schmuck, Richard A. 1997. *Practical Action Research for Change*. Arlington Heights, IL: IRI/Skylight Training and Pub.

Schön, Donald. 1983a. 'The Reflective Practitioner'. *Pediatrics* 116(6):1546–52.

Schön, Donald. 1983b. *The Reflective Practitioner: How Professionals Think in Action*. London: Temple Smith.

Schön, Donald A. 1987. *Educating the Reflective Practitioner: Toward a New Design for Teaching and Learning in the Professions*.

Schostak, John. 2010. 'Participant Observation'. Pp. 442–48 in *International encyclopedia of education*, edited by P. Peterson, B. Eva, and B. McGaw. Elsevier Science.

Schuler, Douglas, and Aki Namioka, eds. 2017. *Participatory Design: Principles and Practices*. Ebook reprint. Taylor & Francis.

Shumack, Kaye. 2015. 'Creative Designerly Mapping: Using Scenario Thinking and Co-Design to Inform a Hybrid Approach to Design Research'. Pp. 236–47 in *The Routledge companion to design research*, edited by P. Rodgers and J. S. R. Yee. Oxon: Routledge.

Simon, H. 1996. *The Sciences of the Artificial*. Boston: The MIT Press.

Smith, Rachel Charlotte, ed. 2016. Design Anthropological Futures: Exploring Emergence, Intervention and Formation. London ; New York: Bloomsbury Academic, an imprint of Bloomsbury Publishing, Plc.

Smith, Hazel, and R. T. Dean, eds. 2009. *Practice-Led Research, Research-Led Practice in the Creative Arts*. Edinburgh University Press.

Steen, Marc. 2013. 'Co-Design as a Process of Joint Inquiry and Imagination'. *Design Issues* 29(2): 16–28.

Stengers, Isabelle. 2008. 'Experimenting with Refrains: Subjectivity and the Challenge of Escaping Modern Dualism'. *Subjectivity* 22(1):38–59.

Stengers, Isabelle. 2015. 'L'insistance Des Possibles. Pour Un Pragmatisme Spéculatif'. Pp. 5–22 in *Gestes spéculatifs*, edited by D. Debaise and I. Stengers. Paris: Les Presses du Réel.

Taylor, Edward. 2000. 'Analyzing Research on Transformational Learning Theory".' Pp. 285–328 in *Learning as Transformation*. San Francisco: Jossey-Bass.

Transforming Learning Centre. 2016. 'About the TLC'. Retrieved 16 October 2020 (https://www.oise.utoronto.ca/tlcca/About_The_TL_CCA.html).

Tuckwell, Dion. 2017. '(Still) Educating Design Thinking'. *Communication Design* 5(1–2):131–44.

Valli, L. 1993. 'Reflective Teacher Education Programs: An Analysis of Case Studies'. Pp. 11–22 in *Conceptualising Reflection in Teacher Development*. London: Falmer Press.

Vaughan, Laurene, ed. 2017. *Practice-Based Design Research*. London: Bloomsbury Academic.

Visse, Froukje Sleeswijk, Pieter Jan Stappers, Remko Van Der Lught, and Elizabeth B. N. Sanders. 2005. 'Contextmapping: Experiences from Practice'. *CoDesign: International Journal of CoCreation in Design and the Arts* 1(2).

Watson, Robert I. 1966. 'Thomas S. Kuhn. The Structure of Scientific Revolutions. (International Encyclopedia of Unified Science, Volume II, Number 2) Chicago: University of CHicago Press

Weaver, W. 1948. 'Science and Complexity'. *American Scientist* 36(4):536–44.

Wenger, Etienne, ed. 2015. *Learning in Landscapes of Practice: Boundaries, Identity, and Knowledgeability in Practice-Based Learning*. London & New York: Routledge.

Wilkie, Alex, Martin Savransky, and Marsha Rosengarten, eds. 2017. *Speculative Research: The Lure of Possible Futures*. Routledge.

Willis, Anne-Marie. 2019. *The Design Philosophy Reader*.

Willis, Anne-Marie. 2006. 'Ontological Designing'. Design Philosophy Papers 4(2):69–92.

Winograd, Terry, and Fernando Flores. 1986. *Understanding Computers and Cognition: A New Foundation for Design*. Norwood, N.J: Ablex Publishing.

Yin, Robert K. 2014. *Case Study Research: Design and Methods*. 5th ed. Los Angeles: Sage Publications.

Young, Fiona, Benjamin Cleveland, and Wesley Imms. 2020. 'The Affordances of Innovative Learning Environments for Deep Learning: Educators' and Architects' Perceptions'. *The Australian Educational Researcher* 47(4):693–720.

Yuille, Jeremy. 2012. 'How Ambiguity and Affinity Are Enacted to Perform Interaction Design'. 194.

Zimmerman, John, Erik Stolterman, and Jodi Forlizzi. 2010. 'An Analysis and Critique of Research through Design: Towards a Formalization of a Research Approach'. P. 310 in *Proceedings of the 8th ACM Conference on Designing Interactive Systems - DIS '10*. Aarhus, Denmark: ACM Press.



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