Transdisciplinarity at the Crossroads: Nurturing Individual and Collective Learning

Chris Riedy, Dena Fam, Katie Ross, and Cynthia Mitchell

> " *At each point in our lives, we are at a crossroads. We are* "
> *the fruit of our past and we are the architects of our*
> *future... If you want to know your past, look at your*
> *present circumstances. If you want to know your future,*
> *look at what is in your mind.*
>
> Matthieu Ricard
> Scientist and Buddhist monk

Practitioners of transdisciplinary inquiry, which we define to include research, learning, collaboration, and action, encounter innumerable tensions. Some tensions are universal, while others are unique to that particular inquiry at that point in time. Resolving these tensions requires innovative practices, which emerge through experience with transdisciplinary inquiry. In this article, we reflect on two decades of transdisciplinary inquiry at the Institute for Sustainable Futures. Drawing on that experience, we argue that one crucial innovative practice is to create space for collective, reflective learning. Such learning frequently takes place in spaces we call "crossroads". These are formal and informal spaces where practitioners who have been on their own transdisciplinary learning journeys (experiencing diverse tensions and applying diverse approaches) come together in dialogue to share, reflect, critically and constructively question, imagine, challenge, and synthesize their experiences into collective organizational learning. Crossroads can emerge spontaneously but can also be consciously nurtured. In our experience, they help us to sustain the innovation needed for transdisciplinary inquiry and to avoid stagnation or routinization. At these reflective, and often times transformative, crossroads, we make sense of our messy, non-linear transdisciplinary journeys and develop innovations to take our transdisciplinary practices forward.

Introduction

Practitioners of transdisciplinary inquiry encounter innumerable tensions. Some tensions are universal, while others are unique to that particular inquiry at that point in time. Some would be familiar to all researchers, while others are specific to transdisciplinary inquiry. Perhaps the most familiar of the latter is the trade-off between breadth and depth of research that must be navigated when moving beyond disciplinary boundaries. There are no agreed rules or conventions for resolving such tensions. Instead, practitioners of transdisciplinary inquiry draw on their experience to develop and test innovative responses to tensions that arise in their context. Given the lack of fixed rules for resolving transdisciplinary tensions, there is much to gain from creating spaces to share these innovations and their outcomes. In this article, we reflect on two decades of transdisciplinary inquiry at the Institute for Sustainable Futures (ISF; tinyurl.com/yczatd9g), focusing particularly on the spaces we have created to share our experiences with each other.

The authors of this article are all researchers at ISF. Established by the University of Technology Sydney (UTS) in 1997, ISF is a transdisciplinary research institute with a mission to create change towards sustainable futures. From the outset, ISF brought together researchers and practitioners from diverse disciplines to tackle wicked problems (Rittel & Webber, 1973) such as climate change, international development, resource scarcity, and social justice. Since the earliest days of ISF, we have conceptualized and described our research as transdisciplinary. Our recent contributions to transdisciplinary theory and practice include Mitchell et al. (2015), Fam et al. (2017), and Fam et al. (2018).

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Our transdisciplinary approach is underpinned by several nested communities of practice (Wenger, 1998, 2010). At a small scale, our researchers form project teams to engage in specific research projects, typically in close collaboration with stakeholders from government, business, or civil society. Membership of these project teams is fluid, shifting with each new project to meet changing research objectives. At a larger scale, ISF has ten research areas:

1. **Cities and buildings:** Improving the liveability of urban environments with holistic and net-positive social, infrastructure and resource solutions.

2. **Climate change and adaptation:** Helping partners adapt to the challenges of a changing climate.

3. **Food systems:** Transforming food systems to ensure healthy, thriving, and food-secure communities and businesses.

4. **Energy futures:** Accelerating the transition to more decentralized energy systems that are clean, affordable, reliable, and empower communities.

5. **International development:** Working in partnerships to end poverty and ensure sustainable development for all.

6. **Landscapes and ecosystems:** Enhancing ecosystem integrity and livelihoods by incorporating perceptions, values, and practices into decision making.

7. **Learning and social change:** Facilitating individual, social, and organizational transformation, learning, and change.

8. **Resource futures:** Advancing responsible and efficient production and consumption by fostering stewardship and circular resource flows.

9. **Water futures:** Developing restorative, sustainable, and resilient water management solutions.

10. **Transport:** Providing solutions for quality transport services that maximize productivity at least cost and lowest impact.

Although membership of these research areas is not fixed, they are more stable than project teams and provide a space for ongoing learning and reflection on project experiences related to the research area in question. These research areas meet regularly and these meetings provide one space for transdisciplinary practice to develop, bounded by problem spaces rather than disciplines.

At a still larger scale, ISF operates a graduate research program, providing research training to masters and doctoral students and postdoctoral fellows. Again, membership changes as students move through the program, but the program provides a relatively stable reflective space for approximately 45 students and their supervisors. In addition to individuals, project teams, research areas, and the graduate research program, ISF as a whole also provides space for collective reflection through planning days, regular informal presentations and dialogues, and staff meetings.

Although there is no consensus even within ISF on what constitutes a transdisciplinary approach, we believe that it is:

• **Purposive:** positive change within a wicked situation is an explicit goal of the research.

• **Holistic:** it engages with the past, present, and future of whole systems and transgresses disciplinary and governance boundaries.

• **Participatory:** given that diverse stakeholder perspectives (beyond academia) are necessary to achieve progress on wicked problems, it allows us to see more of the whole picture and encourage ownership of, and equitable benefit from, responses.

• **Innovative and experimental:** it enables testing of ideas through real-world interventions and action research.

• **Dynamic:** the research plan adapts to the changing context and new knowledge.

A transdisciplinary inquiry involves more than research; it is an integrated process of research, learning, collaboration, and action. It incorporates cycles of action and practice that inform research and theory development, which in turn inform new practice. These cycles are connected by a constant process of reflection and sensemaking that supports innovation and deepens both theory and practice.

Our engagement with transdisciplinary approaches over the past 20 years has been an ongoing "learning

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journey" (Crick, 2007) with many twists and turns, propelled by the exploratory work of our cohort of postgraduate research students and the action research of our academic staff. Writing about the learning journey metaphor, Crick (2007) depicts the learner as "a person, with a sense of self, identity and intention, who has an objective or an outcome in mind, and who moves through a particular domain, engaging in inter- and intra-personal learning practices along the way". Each person, project team, and research area at ISF regularly undergo markedly different learning journeys as they engage in applied transdisciplinary inquiry. Learning journeys are diverse due to the unique:

• topic, scale, or location of the research.

• composition, capacities, experience, and dynamics of the internal and external team.

• methodologies created and blended for scoping, probing, inquiring, sensing, meaning-making, analysis, synthesis, emergence, communicating, and embedding the research.

Considering that ISF has over 80 staff, 45 graduate research students, 400 projects per year and 10 research areas, working across Australia and internationally, we experience great diversity in individual and team learning about transdisciplinary inquiry. We have learned that transdisciplinary inquiry is characterized by diverse tensions or challenges, experienced differently by different individuals and teams. For example, transdisciplinary inquiry may need to:

• pause to take the time required for appropriate methodologies to emerge from and for the unique conditions of the project (Meadows, 2008).

• justify its value, when the types of outputs of transdisciplinary research are valued differently to those produced by Mode 1 science (Gibbons et al., 1994; Mitchell et al., 2015).

• collectively explore fluid yet guiding boundaries (Midgley, 2000).

• collaboratively reorient the goals of the research toward meaningful aims yet allow for emergence (Brown & Lambert, 2012).

• speak, interact, and integrate across disciplinary boundaries and worldviews, while maintaining the depth of the disciplines (Mitchell & Ross, 2017).

• engage at the paradigmatic (Ross & Mitchell, 2018) and worldview (de la Sienra, 2018) levels, while also being pragmatic.

• create meaningful dialogue in an ongoing way and generate genuine trust while engaging with challenging questions of power and ownership.

• provide space for individual agency while working towards a shared goal (Freeth et al., 2019).

• build capacity and capability for clients and collaborators to value the processes of and insights from transdisciplinary approaches.

• reformulate contractual models to allow for flexibility in specific project deliverables.

• devote time for long-term, well-funded transdisciplinary projects, while recognizing that many funders are not seeking this type of approach.

Although the authors cited above, and others, have written much about these challenges and unexpected perturbances, the important point is that we are still, and perhaps always will be, collectively learning how best to resolve them. There is much to learn from sharing diverse individual and team innovation that emerges in response to them. Therefore, learning is central to our definition of transdisciplinary research and practice: it underpins innovation and catalyzes organizational and social change (Colvin et al., 2014). Further, the type of learning required to resolve the tensions identified above is often transformative. Transformative learning involves "a deep shift in perspective, leading to more open, more permeable, and better-justified meaning perspectives" (Cranton & Taylor, 2012). Such learning is frequently needed if we are to fully see tensions in transdisciplinary inquiry and find innovative pathways through them.

In this article, we reflect on how ISF achieves collective, and often transformative, learning through sharing, discussing and reflecting on our diverse individual and team learning journeys. There are two important aspects to this collective learning. First, we need to give our researchers sufficient freedom and agency to cultivate distinct, individual learning journeys, take risks, and develop innovative transdisciplinary inquiries. Second, we need to create or support intersection points for collective, organizational learning. These intersection points, or "crossroads", are places of innovation where habitual ways of seeing the world are challenged and

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new ideas emerge. It is these crossroads that are the focus of this article. The relationship between learning journeys and crossroads is shown conceptually in Figure 1.

Transdisciplinary Crossroads at the Institute for Sustainable Futures

In reflecting on where innovation happens in our collective transdisciplinary practice, the metaphors of "learning journeys" (Crick, 2007) and "crossroads" emerged. In our research projects, we are constantly learning about the context and process of transdisciplinarity, and different ways to respond to the tensions and challenges identified earlier. The unique and particular history of individual researchers as they work on diverse research projects creates a distinct learning journey, which is defined by the experiences they have, the thinking they do, the perspectives they are exposed to, and the practices they employ to make sense of these experiences. This individual learning journey contributes to our particular worldviews and assumptions about transdisciplinary inquiry (i.e., research, learning, collaboration, and action).

We have found that creating collective spaces where individuals can come together and reflect on their individual learning journeys is crucial to ISF's transdisciplinary practice for two reasons. First, sharing

experiences is itself a valuable source of learning for ISF as an organization. Being exposed to situations others have experienced, including alternative forms of transdisciplinary practice, adds to our own experience and may trigger ideas that we can apply in our own research projects or warn against particular approaches. For example, one of the authors tested an idea for rapidly establishing transdisciplinary research teams through an intensive workshop process inspired by social innovation labs (Westley et al., 2012) and found it was not possible to short-circuit the lengthy trust-building and dialogue process that typically characterizes the start of a transdisciplinary research project. Sharing this experience, in this case through a collective writing project, helps others to avoid going down a similarly unproductive path. Second, reports from other learning journeys may challenge aspects of our individual practice that have become rigid and may be stifling innovation.

We can think of these spaces where individual learning journeys intersect with collective learning as "crossroads". These crossroads can emerge organically, through spontaneous conversation. However, there is also a role for purposefully creating and nurturing such spaces to support a transdisciplinary practice. We build such spaces into our projects but also create them at larger scales through research area meetings, postgraduate retreats, informal seminars, and writing projects. There is overlap between the notion of a crossroads and
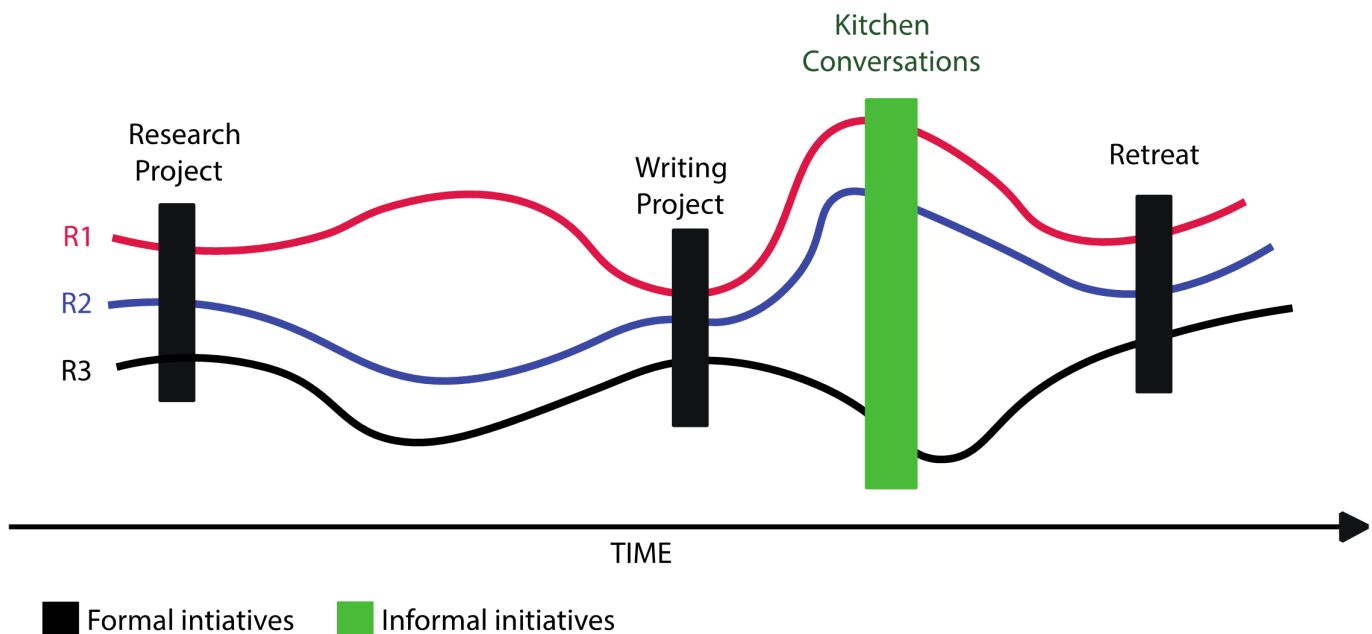

Figure 1. Learning journeys and crossroads

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Wenger's (1998, 2010) concept of a community of practice, however crossroads can be more ephemeral and transitory. A fleeting conversation in the corridor is not a community of practice, but it can act as a crossroads where learning takes place. At these crossroads, different worldviews come together and can clash or resonate. These worldview interactions can trigger learning and innovation. Several examples of crossroads are described below.

Crossroads Example 1: Collective Writing

One of the authors spent time helping a teaching institute in New Zealand that had little transdisciplinary experience to establish a new transdisciplinary research master's degree. The experience is documented in Riedy (2016). To help with teaching transdisciplinary practice to program staff and supervisors, he developed and used some simple definitions of transdisciplinary research which then became embedded in his own worldview of what transdisciplinary research is. In essence, he came to think that anything that did not continuously involve non-academic participants at all stages could not be called transdisciplinary research. He documented this position in an early draft of a chapter for a book edited by current and former ISF staff.

Upon reviewing the book chapter, one of the other editors pointed out the rigidity of a definition of transdisciplinary research that is not willing to compromise at all on involvement of stakeholders. Such a definition fails to recognize the inevitable trade-offs and tensions that happen in practice. For example, there are stages of the research process that stakeholders are less interested in, and there is always a balance to strike between opportunities for participation and the other constraints on stakeholder time. For the author, the collective writing project acted as a crossroads where he learned to let go of a rigid definition and be more flexible in balancing the tensions associated with stakeholder involvement. This led to innovations in his practice for working with stakeholders. For example, he designed a research project on cohousing for older people that envisaged stakeholder involvement using concentric rings – a closely involved inner ring (Steering Group) that met monthly, a supportive middle ring (Advisory Group) that met quarterly, and an outer ring of participants that often had only a single touch point with the project. This proved highly effective.

Crossroads Example 2: The Annual Graduate Research Retreat

A two-day annual residential retreat for research students and their supervisors is a key space for collective learning at the intersection of theory and practice. Our first annual retreat was held in 2002. Before each retreat, participants engage in the design and planning of the program to meet current collective learning needs. At the retreat, supervisors and students deliver or participate in facilitated sessions. Examples include defining transdisciplinary research, change creation models, systems thinking tools and methods, theories of change, writing and publishing tips and tricks, and epistemological stance. There is typically a mix of sessions requiring deep theoretical engagement oriented towards enabling shared conceptual leaps and time for reflection on how these leaps might manifest in students' and supervisors' research activities, as well as sessions more focused on practical "tips and tricks" for graduate research.

Riedy and co-authors (2018) explored the way in which our annual retreat functions as a community of practice. In the current article, our focus is on its role as a crossroads for collective learning. Graduate research students (and their supervisors) embark on learning journeys that, by definition, take them into new territory; their work must be original and innovative. When those students engage with diverse disciplines, as they do at ISF, a transdisciplinary practice can be greatly enriched by sharing innovations from these journeys. While there are many places where such sharing can take place, holding a collective annual space open to all has been crucial to our evolving transdisciplinary practice.

At this crossroads, where individual learning journeys intersect, something new often emerges. We use the phrase "Aha! moment" to capture the feeling of breakthrough and innovation that can arise from our engagement with each other. An "Aha! moment" can be individual or collective. Exposed to other perspectives, individuals form new insights that they carry back to their individual journeys. These insights can take many forms – new knowledge, new theories, new practices, new questions. Collectively, we find that creating a space for engagement with a common question or challenge leads to conceptual leaps forward that later become embedded in our own transdisciplinary practice. Many of these conceptual innovations now form the

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canon of our graduate research program, passed on to new students in annual workshops, but developed for the first time at retreats. It should be no surprise then that we recommend setting aside an annual protected space for transdisciplinary engagement – a formal crossroads – as the centrepiece of a transdisciplinary practice.

Crossroads Example 3: Roundtable Sessions

Earlier this year, a group of ISF researchers, from research students to senior staff, met with the goal of strengthening and diversifying ISF's collective conception of transdisciplinary research. Our researchers' degree of engagement with theoretical and conceptual frameworks for transdisciplinary research varies from deep to none, although we would argue that all of them are frequently involved in transdisciplinary research in practice. The group organized a roundtable session and invited ISF researchers. These sessions are held weekly at ISF over lunch, usually with an hour allocated for presentation and discussion.

After drawing out individual definitions of transdisciplinary research and presenting some favourite conceptual frameworks for transdisciplinary research, the session moved into discussion. One staff member posed a wonderful question: is sailing a ship transdisciplinary? This prompted a significant pause for reflection. A response to the question took some time to emerge and our eventual response was that it is not, for two reasons. First, our definition of transdisciplinary research stresses the goal of purposive transformation in a wicked situation – in particular, a mission to create change toward sustainable futures – which is not a goal when sailing a ship. Second, we came to reflect on the political nature of the word "transdisciplinary" and the way in which it only makes sense in a context in which disciplines exist, as its starting point is a critique of those structures. It is ultimately an academic term and may be of little value to people outside academia, including sailors. This latter reflection was an important collective learning emerging from this constructed crossroads that may go on to shape the way we communicate our research approach to others.

Crossroads Example 4: Informal Unplanned Conversation

What we have learned over time is that many stakeholders expect research to be a linear, unwavering process from beginning to end, and are uncomfortable with a research project that adjusts based on new insights.

That means our teams must decide whether to stay close to the expected frame or to take a systemic approach, allowing for emergence based on the complexities we collectively uncover. Both approaches are valid: the former allows more investment in data and analysis, whereas the latter requires more investment in processes with our partners about what constitutes valid and valuable research.

One of the authors was awarded national funding for a collaborative three-year transdisciplinary research project in Indonesia on how to improve the governance of community-based sanitation. Having no experience of Indonesia, she took the decision to follow an emergent approach. Costs for community-based sanitation (who paid, how much, and when) emerged as a heavily contested area. We explored people's experience of costs through two collaborative workshops in different provinces with those responsible for managing these systems, and we triangulated these against the limited literature available. This gave us sufficient confidence to stand behind a new and significant insight: that community-scale technologies placed a far higher (approximately 10x) cost burden on communities than either centralized or household-scale services.

In contrast, a colleague also working in Indonesia had identified costs as significant within a study on private water service provision, and was about to embark on a very large scale quantitative household survey to develop what she saw as a sufficiently defensible dataset. Through a corridor conversation with our colleague that began with, "How was your trip to Indonesia?", we were prompted to reflect on our research approach and to revisit assumptions of what constitutes validity in data, analysis, and claims in transdisciplinary research. We reflected that neither approach is right or wrong, but that each has different strengths and weaknesses. It was the juxtaposition of the two methods from different teams facing similar questions in related contexts that allowed us to "diffract" or see the differences that matter. As a result of this informal crossroads prompt, we revised and clarified our representation of costs to better align with the strengths of experiential insights but also the lack of statistical rigour (Mitchell et al., 2016).

Conclusion

The four examples above describe constructed and emergent crossroads where individuals come together to engage in collective learning about transdisciplinary inquiry. Others include international projects that expose researchers to different cultural perspectives on

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transdisciplinary inquiry, and guest lectures or presentations on transdisciplinary research when we check in with our colleagues on our latest thinking. In our reflection for this article, we have recognized how crucial such crossroads are for ongoing innovation in our individual and collective transdisciplinary practice. To nurture this innovation, we need to provide freedom for our researchers to exercise agency and embark on their own individual learning journeys into different contexts (topical or cultural) within shifting project teams while at the same time creating the space for emergent and constructed crossroads at which "individual learners" come back together to reflect on their learning.

There is something qualitatively different that emerges from collective reflection spaces: prompted by the clash and resonance of diverse perspectives, they are more likely to lead to "transformative learning" experiences, where perspectives shift and innovation emerges. Encouraging our researchers to travel down different paths with different people in different contexts means that the experiences and perspectives that they bring back to the collective are richer and more diverse. Consciously cultivating collective reflection spaces such as retreats, collaborative writing projects, and roundtables creates collective opportunities for innovation arising from individual learning. The individual learning journeys refresh and reinvigorate our collective learning and also have the potential to reinforce assumptions picked up along the way. We believe that transdisciplinary innovation needs both individual and collective learning: crossroads where learning journeys have the potential to intersect are essential for both. We also recognize that, while ISF strives to create such crossroads, there is much more we still need to do if a transdisciplinary practice is to thrive throughout ISF and beyond. We hope the metaphor of the crossroads will help others to structure and support innovation in transdisciplinary inquiry.

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