Researching Collaborative Interdisciplinary Teams: Practices and Principles for Navigating Researcher Positionality

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Abstract

Collaborative interdisciplinary research is on the rise but can be difficult and daunting. There is much to learn by studying the inner workings of collaboration, to the potential benefit of both science and technology studies (STS) and those who collaborate. We have been studying the inner workings of a collaborative interdisciplinary team using formative accompanying research (FAR). Assuming multiple insider-outsider vantage points implied adopting dynamic positionality in relation to the team. In this article, we outline an approach to navigating positionality based on these research experiences. Navigation is aided by identifying learning orientations to a collaborative team, to learn about, with or for the team; and by adopting practices and principles to balance i) observation and participation; ii) curiosity and care; and iii) impartiality and investment. We illustrate what we have learned so far, demonstrating how to apply these navigating instruments so that the skilful use of FAR positionality can advance the understanding and practice of collaborative interdisciplinary research.

Keywords:interdisciplinary collaboration, research methodology, dynamic proximity, critical reflexivity, embedded relationality, participant observation

Introduction

The proliferation of collaborative interdisciplinary research is well documented (e.g. Klein 2015; Stokols 2014). By collaborative interdisciplinary research, we mean research conducted through teamwork that integrates two or more disciplines or fields of knowledge (National Academy of Sciences et al., 2005; Pfirman and Martin, 2010). Indeed, such is the contemporary appeal of interdisciplinarity that Jasanoff (2013: 99) has portrayed it as "the new Canaan, the promised land where ailing scholarly traditions go to be reborn and academic creativity is set free." However, it remains difficult to translate aspirations of productive and meaningful interdisciplinary collaboration into successful research projects (Darbellay, 2015; Strober, 2011; Weingart, 2014). Barriers to success range from the institutional and administrative to the interpersonal and emotional (Fitzgerald et al., 2012; Klein, 1990).

At the interpersonal level, epistemic and social difficulties can arise from the complexity of dealing with high levels of heterogeneity. Members of an interdisciplinary team are tasked with integrating different research goals, research methodologies and types of knowledge, which involves working across different disciplinary cultures and working styles while engaging with plural quality criteria, value systems and norms (Boix Mansilla, 2006; Hampton and Parker, 2011; Strober, 2011). Thus it is unsurprising that there is considerable ambivalence with regards to collaborative interdisciplinary research – what Padberg (2014: 96) refers to as 'reservation' and Ledford (2015: 309) as 'resistance'. Ambivalent team members constitute an additional difficulty, sending mixed messages that can foster confusion and inertia in collaborative teams. In sum, there is a tension between assumptions on the one hand that interdisciplinary collaboration can address the complexity of contemporary research questions and thus deserves considerable investment of time, effort and funds (e.g., Gleed and Marchant, 2016) and, on the other hand, the myriad barriers and uncertainties faced when engaging in such collaborations.

Considerable research attention has already been paid to learning about collaborative interdisciplinary research and to advancing it. However, there is relatively little research on the inside, lived experiences of interdisciplinary collaboration (Callard et al., 2015; Mauthner and Doucet, 2008), where interpersonal difficulties manifest (Barry and Born, 2013). For example, Fitzgerald et al. (2014: 701) note that the field of science and technology studies (STS) has not given much account of "what it is actually like to participate in such a research space." However, when reading the few accounts that do exist, such as those by Fitzgerald and colleagues about their involvement in a collaboration between neuroscientists and social scientists (Callard and Fitzgerald, 2015; Fitzgerald et al., 2014), it is difficult at times to discern whether they are describing their experiences as STS researchers or those of the collaborative team they were studying. Indeed, STS investigations into the lived experiences of collaboration can create enmeshed "… obligations, concerns, loyalties, friendships, contradictions, hopes and fears" (Balmer et al., 2015: 9), particularly if there is a shared interest in the research topic. The resulting risk is that a researcher who moves between the inside and outside "can lose her sense of herself" (Humphrey, 2007: 23) and, we would add, lose track of her positionality in relation to the team. The possibility of becoming disorientated is particularly strong in the complexity and "messiness" (Cosley et al., 2014) of a large collaborative interdisciplinary project. Acknowledging the inevitability, and merit, of a certain degree of entanglement, we propose methodological guidance to navigate it and thus reduce the risk of an STS researcher losing their bearings altogether.

To this end, we introduce a methodology we are using to conduct research in a large collaborative interdisciplinary project. This methodology, which we have called formative accompanying research (FAR), is committed to promoting knowledge about interdisciplinary collaboration while collaborating. The first author, (Rebecca Freeth) is conducting FAR as a member of the collaborative team, supported by the second author (Ulli Vilsmaier). We both span disciplinary boundaries in our own research work, sharing an interest in the field of sustainability as well as in inter- and transdisciplinary knowledge regimes. We have worked with collaborative teams over many years, facilitating, co-ordinating, collaborating with and accompanying inter- and transdisciplinary research projects. When taking on certain of these roles we had experienced advantages of being mostly outside the core team. But we had also identified the limitations of lacking a deep understanding of the challenges and difficulties that are faced inside collaborative teams. Drawing on these experiences, we developed and implemented FAR, operating on the assumption that being on the inside offers a deep vantage point to experience the inner workings, while explanations about the mechanisms of such collaborations benefit from the distance afforded by moving further away.

The distinctiveness of FAR lies in its dynamic positionality, which emerges from its characteristic movement between learning *about*, *with* and *for* a collaborative research team. Learning *about* has the epistemic goal to create transferable results, pursued in the role of scientific researcher.

Learning *with* has the goal to learn alongside the team, in the role of a team member. Learning *for* has the goal of supporting the team to advance its research outcomes, in the role of an intervener. To support purposeful movement between the three learning orientations, in this article we identify and discuss the following as navigational aids, which also serve to define FAR:

1. Three balancing acts: between observation and participation; between curiosity and care; and between impartiality and investment;
2. Three practices to negotiate the paradoxes implicit to each balancing act: a practice of dynamic proximity to navigate between observation and participation; a practice of critical reflexivity to guide the exercise of curiosity and care; and a practice of embedded relationality to balance impartiality with investment; and
3. Three anchoring principles: congruence, sensitivity and translucence.

Thus we seek to traverse dualistic imaginaries of a researcher being and doing either this *or* that by substituting a practice of fixed positionality with practices of dynamic positionality. Our intended contribution is a methodology that has potential to advance collaborative interdisciplinary research by remaining oriented and fleet of foot amid the inevitable entanglement, complexity and messiness.

To make this proposal, we start by introducing FAR in relation to neighbouring methodologies and the collaborative project in which we have applied it, entitled Leverage Points for Sustainability Transformation (Leverage Points). Then we outline the methodology itself in terms of its approach to dynamic positionality and the balancing acts that this involves, and present a series of practices and principles to navigate those balancing acts. Using examples from our experience, we demonstrate how this approach can work as a heuristic for navigating dynamic positionality and identify modest initial successes as well as pitfalls. The article ends with prospects for further investigation.

Locating formative accompanying research

FAR can be located in relation to other, neighbouring, methodologies that learn about, with *or* for projects. We start with the two at the core of the FAR terminology – i.e. formative research and accompanying research. Accompanying research is a direct translation of *Begleitforschung* in the German-speaking context. However, *Begleitforschung* refers to an amorphous range of research activities, broadly studying the impact of technology, and is most directly comparable to ethical, legal and social implications research (ELSI) (Fiedeler et al., 2010). In a bid to address the semantic and methodological confusion, Defilia and Di Giulio (2018) have proposed a typology for accompanying research, which differentiates complementing, meta and integration-oriented types. Using this typology, the distinguishing feature of FAR is that it can move between all three.

Formative research runs contemporaneously with a (research or other) project, generating information to trigger ongoing reflection and adjustment. It aims to strengthen project design and implementation through iterative cycles of feedback and learning (Reigeluth and Frick, 1999; Chen, 2010). The possibility to not only learn *about*, but to learn *with* and *for* a collaborative team gives FAR opportunities to play a formative role, helping to shape a collaborative project while there is still malleability in its design. It is also here that the potential to advance collaborative interdisciplinary research lies, at the micro scale of the project. None of the existing descriptions of accompanying or formative research capture the idea of research positionality constituted in movement, between insider and outsider roles as proposed in FAR.

FAR can also be considered in relation to methodologies designed to research and promote interdisciplinary collaboration, such as Socio-Technical Integration Research (STIR) (Gjefsen and Fisher, 2014) and the Toolbox Dialogue Initiative (O'Rourke and Crowley, 2013). What they have in common with FAR is an appreciation of the value of "interactional expertise" (Collins and Evans, 2002) in collaboration – i.e., the capacity to engage meaningfully across disciplinary and other differences in academic environments. However, their

strategies are intervention-oriented, to remedy largely predefined problems of collaborative interdisciplinary integration (Fisher et al., 2015) as opposed to FAR's slower and more exploratory emphasis on learning *about* and *with* a collaboration, alongside possibilities to learn *for.*

FAR bears similarities to, and is distinguishable from, embedded research (e.g., Hackett and Rhoten, 2011) and ethnographic research (e.g. Beaulieu, 2010). Like embedded research, FAR foregrounds the advantages of being positioned within the project being researched. However, embedded researchers tend to be temporary sojourners, having a primary research home elsewhere, and their research has pre-formulated and instrumental outcomes – such as strengthening the efficacy of health systems (Olivier et al., 2017). By contrast, a formative accompanying researcher remains *in situ*, anticipating a strongly emergent flavour to learning outcomes. While FAR does not share the sociological or anthropological disciplinary roots of most ethnographic research practices, it gains from a rich ethnographic tradition of research into research (e.g., Beaulieu, 2010; Rabinow, 2011; Thompson, 2009) and has potential to contribute further insights into the "chameleon"-like qualities (Balmer et al., 2015: 16) of an ethnographic STS researcher.

Thus we locate FAR within the field of STS, acknowledging the diverse sources of intellectual inheritance on which STS draws (Jasanoff, 2013). A FAR approach is intended to slip free of the ethical, legal and social implications (ELSI) era of STS and thus avoids joining the ranks of "joyless and humourless handwringers" bent on keeping science accountable (Balmer et al., 2015: 7). While we see potential for FAR to strengthen practices of interdisciplinary collaboration, this is about generating awareness and learning within collaborative projects rather than sanitizing them or imposing order. Thus FAR aligns well with the post-ELSI approach to STS, which seeks to be more intimately engaged and constructive, with the aspiration that "…'working with' scientists and getting further entangled could help to produce novel and more diverse forms of objects *and* knowledge for *all* participants." (Balmer et al., 2015). Furthermore, this takes advantage of what the European Science Foundation notes as "the emergence of a *self-consciously interdisciplinary practice* within the modern academy" (Fitzgerald et al., 2012: 11 emphasis added). The Leverage Points project is an example of more self-consciously interdisciplinary research.

The Leverage Points collaboration

The Leverage Points project aims to critically examine deep leverage points for sustainability. Inspired by the work of Donella Meadows (2008), it focuses on three realms of leverage: restructuring institutions, re-connecting people with nature and re-thinking knowledge production for sustainability (https://leveragepoints.org; Abson et al., 2016). The international team consists of 23 researchers from multiple disciplinary and interdisciplinary backgrounds spanning the social and natural sciences, as well as law, engineering and design. The Leverage Points project is a case of "functional interdisciplinarity" characterised by "data exchanges and common epistemological approaches linking different disciplines and framing integrated research projects" (Whatmore, 2013: 166–167). Co-locating all the researchers at Leuphana University in Germany facilitates day-to-day collaboration. Deeper integration is attempted through combining conceptual work with empirical research and transdisciplinary case studies. When the project was initially conceived, it was decided that one of the researchers would study the team itself, in the role of a formative accompanying researcher. The purpose, as expressed in the initial project description (Lang et al., 2014: 19) was to investigate processes and team dynamics of collaborative knowledge production and to use the insights gained to "inform, shape and improve the research process" of the Leverage Points project on an iterative basis. Thus the ultimate objective of FAR was not only to learn about, but also to advance the practice of collaborative interdisciplinary research in this project, and to the benefit of other interdisciplinary research collaborations.

As the formative accompanying researcher, Rebecca Freeth has been provided with two offices. One is co-located with the Leverage Points team and the second is under the auspices of the Methodology Center, where FAR has been conceptualised. Despite the strong presence of

natural science expertise in the team, the majority of team members have experience or a qualification in social science and there was a mix of methodological preferences. As a result, and in contrast to some STS accounts in interdisciplinary collaborations (e.g., Callard and Fitzgerald, 2015; Viseu, 2015), the formative accompanying researcher was not isolated or embattled by virtue of being in a disciplinary or methodological minority. Instead, the main challenge for FAR at the outset was one of positionality.

Navigating positionality: Balancing acts and practices

What we miss in much of the STS work as well as other ways of studying collaborative research, such as science of team science (SciTS), is an approach that does methodological justice to the complexity of the research situation being studied. Given that FAR is constituted on the move, we are seeking ways to work with the complexity in a methodologically sound way. For this, we draw on Haraway's (2004: 5) argument in favour of creating "situated accounts", which involves being "in the action… finite and dirty, not transcendent and clean" (Haraway, 1996: 439), without getting lost in the action. Our approach to FAR is based on how this theoretical stance could apply in practice, providing guidance rather than guidelines. Organizational scholar Czarniawska (1997: 177) notes that, as researchers, "…we generally remain blind to our own role and position." If this is true for research in general, how much more significant is it that research into research makes its positionality explicit, particularly when studying collaborative interdisciplinary research? However, Balmer et al. (2015: 19) observe that in STS research, a reflexive approach is "more talk than practice".

The concept of positionality indicates the situatedness of any researcher and enables the context of their research to be taken into account (Vilsmaier, 2012). Our approach to positionality is both epistemological and methodological. We understand positionality of a formative accompanying researcher to comprise three interrelated aspects. At a practical level (i) positionality describes *physical location*, the temporal and spatial proximity to the research team with which a formative accompanying researcher works, and their constantly shifting positions in relation to the team. These movements indicate that (ii) positionality also represents *methodological strategies* a formative accompanying researcher can adopt to navigate degrees of proximity. These strategies further imply that (iii) positionality is a *reflexive research practice* of adjusting proximity, taking seriously the ethical considerations of power inherent in being both participant and observer (Eyben, 2009).

Figure 1 presents three sets of tensions a formative accompanying researcher is likely to encounter that may pull them in multiple directions. We translate these tensions into three balancing acts for a researcher to navigate, guided by practices and principles. The first balancing act between participation and observation amplifies well-documented tensions inherent in conducting participant observation, (e.g. Pink 2012; Quinn Patton 2014). This is also expressed as being an "insider-outsider" (Humphrey, 2007) and has implications for what the researcher can see by virtue of their location in relation to the collaborating team. A second balancing act between curiosity and care relates to how the researcher sees, through the kind of scientific gaze they adopt (following Haraway, 1988). The third balancing act between impartiality and investment deals with the visibility of the researcher's own interests, related to

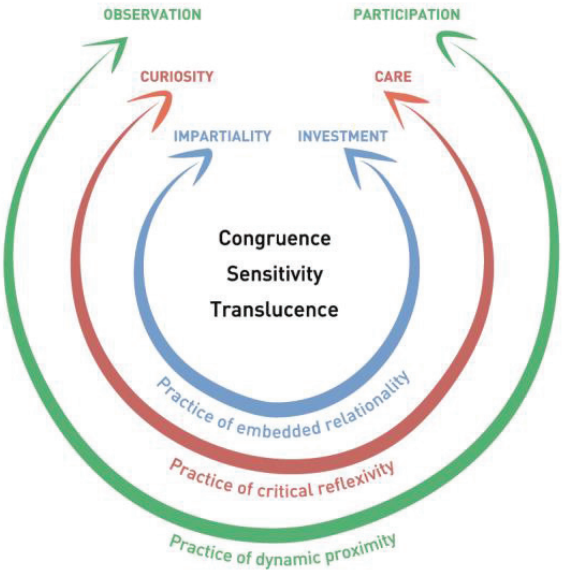

Figure 1: Navigating FAR positionality: Balancing acts, practices and principles

dynamics of partiality and power in research relationships (e.g. Blædel 2013).

If one assumed that balance was something to be found and then maintained, it would be tempting to use these balancing acts as an answer to the question: should the FAR researcher be an impartial *or* invested observer *or* participant, acting with curiosity *or* care? Instead we propose that each balancing act represents a continuum and that all positions along this continuum are possible and appropriate at different times. Moreover, no position exists independently but in relation to other positions on the continuum. Each continuum is curved to express the idea that the ends are not polar opposites (Fig. 1). This opens up the possibility that moving from one end of a continuum to the other could happen by traversing the full line between them, or by leaping the gap. Presented this way, the balancing acts are designed as an instrument to identify, at a particular moment in time, the particular co-ordinates of the researcher's positionality, and movement between different moments in time. This helps to inform a reflexive FAR practice without inhibiting its characteristic fluidity.

Balancing Act 1: Observation and Participation

Bruno Latour (1999: 26), accustomed to tracking scientists and their science in laboratories and archives, "decided for a change to observe a field expedition", accompanying a team of natural scientists to Brazil to take soil samples. As the others busied themselves with the technical rigors of their science, he turned his observing lens on himself, "What about me, standing here, useless, arms dangling …?" (Latour, 1999: 47). When does a researcher, primed to do participant observation, instead find himself an awkward, gawking spectator?

This question about the degree to which a researcher is, at any time, more a participant or more an observer is a function of two interdependent aspects: their *location* nearer or further away, and their *role* as insider or outsider - or more accurately, as both insider and outsider. In terms of location, different degrees of proximity afford different perspectives (Berger, 2013), which holds "not only in a spatial but also in … a metaphoric sense." (Breuer and Roth, 2003: 3); A researcher's proximity, whether literal or figurative, creates blind spots. One type of researcher blind spot is born of over-familiarity; a hazard of being too close or "too much of an insider" (Gunasekara, 2007: 469). Another risk of close proximity, but the opposite of a blind spot, is magnification. If a researcher is highly sensitized to a particular phenomenon, they might exaggerate its presence in their observations (Russell and Kelly, 2002). Science has been studied across a spectrum of proximities, from far away in space and time (e.g. Kuhn's reconstruction of Newton's scientific revolution) to very close in space and time (e.g. Knorr Cetina's ethnographic work in laboratories). However, Knorr Cetina was an outsider to the scientific team, pursuing her own research questions. Hackett and Rhoten (2011) differentiate between inside-out and outside-in STS. FAR represents a case of the former, pursuing research questions developed in consultation with the collaborative interdisciplinary team being researched.

Inside-out research has consequences for how the researcher's role is perceived, often resulting in multiple, conflicting expectations (Brohm, 2009). The ones being researched may harbour and express concern about this role, not least because of the legacy of the science wars, which continue to cast a shadow (Fortun, 2005). Humphrey (2007: 23) warns that an inside-out researcher "can be pushed and pulled along an invisible insider-outsider continuum by others who have a vested interest in who she is and what she is doing …"

We propose a practice of dynamic proximity to manage the inherent paradoxes of this balancing act between observation and participation. Inspired by the dialectical approach of Eberle & Maeder (2011) to organizational ethnography, a FAR practice of dynamic proximity guides movement between:

- Being near enough to pick up details, and far away enough to be able to see as much of the whole-in-context as possible;
- Being near enough to discern opportunities for team reflection, but not so close that this happens solely by virtue of the formative accompanying researcher's intervention; and

- Being near enough to perceive when the conditions are ripe for team-level learning, and to nurture these conditions, and far away enough to avoid imposing a learning agenda.

Studying a team from multiple perspectives along the observation – participation continuum gives the researcher access to internal dynamics that either enable or disable collaboration. Given that such dynamics are "rarely recognised let alone discussed" in academia (Strober, 2011: 2), it becomes important how the researcher balances curiosity and care in the scientific gaze they direct towards the collaborative team.

Balancing Act 2: Curiosity and care

Curious researchers can set in motion a series of unintended consequences for the situation they are studying. If even the seemingly benign act of interviewing can trigger changes in interviewees' relationships with what they had previously taken for granted (Müller and Kenney, 2014), does the researcher have a responsibility to take greater care?

STS research has at times been characterised by a particularly intrusive brand of curiosity, epitomizing "powerful rhetorics of witnessing and revelation" (Garforth, 2012). The question of care has gained significant attention in recent years with moves from a dispassionate stance to recognition that "[I]f something is constructed, then it means it is fragile and thus in need of great care and caution" (Latour, 2004: 247). Puig de la Bellacasa (2011: 98) builds on this, suggesting that where other people are involved, "care is a doing necessary for significant relating". Conscious that care taken by women researchers could fall into gender stereotyping traps, she asserts that it is possible to care in a non-sentimental fashion. In a similar vein, Atkinson-Graham et al. (2015: 746) refer to a "politics of care". Thus scientific curiosity, described by McCarty (2016: 79), as the "urge to know" is still given free rein, but is a more careful curiosity, attuned to possible impacts of the research on the other and the potential that "accompaniment" in science can "…contribute to and constitute a *flourishing* existence" (Rabinow, 2011: 217).

In the case of FAR, the notion of 'accompaniment' implies walking in step with those being researched. This implies that the researcher's gaze is not always directed straight at the collaborative team but is sometimes cast with interest in the same direction in which they are looking. We propose a practice informed by "critical reflexivity" (Haraway, 1991: 197) to balance scientific curiosity and care, avoiding the extremes of cavalier intrusion and paralyzing caution. If critical reflexivity infers "turning of the researcher lens back onto oneself to recognize and take responsibility for one's own situatedness within the research and the effect that it may have on the setting and the people being studied … " (Berger, 2013: 220), a FAR practice of critical reflexivity enables movement between:

- Being curious enough to stay in inquiry mode, alert to surprise;
- Being caring enough to know when is the right time to dig deeper into inquiry. Some developments in collaborative teams need time to mature before being scrutinized; and
- Being non-sentimental enough to care about a team's wellbeing without becoming custodian of it.

Insights gained from learning *about* a team's epistemic and social dynamics in this way can potentially be used to learn *with* a team, opening up possibilities to reflect together on how team interactions either facilitate or hinder achievement of their shared research goal. However, this also creates the risk that the formative accompanying researcher becomes overinvested in the team's research success, which ushers in the third and final balancing act of impartiality and investment.

Balancing Act 3: Impartiality and investment

Where once the scientist's invisibility and detachment were sources of trustworthiness, now Haraway (1996, 2004) and Jasanoff (2004) suggest that the scientist is trustworthy only when they no longer erase their presence from their scientific work and instead deal with the consequences of presence.

Wherever a researcher is positioned on the observer – participant and curiosity – care continuums at any one time, they have vested interests that carry power. Thus in our third balancing act, we propose impartiality at one end of the continuum, distinguishing 'impartiality' as being aware of interests but seeking to remain unbiased, from 'neutrality' as claiming to be interest-free and/or unaware of interests. At the other end of the continuum is investment. When a FAR researcher observes a project meeting in which decisions are being made which affect her as a member of the project team, she is invested. The continuum as a whole is about degrees of conscious interest by a researcher in what is at stake. Haraway (1988: 585) does not see a contradiction between being objective and partial, advocating for "… a practice of objectivity that privileges contestation, deconstruction, passionate construction, webbed connections, and hope for transformation of knowledge and ways of seeing." Whether learning about, with or for an interdisciplinary team, the researcher is in relationship with the people and situations she is researching. What, and who, she is studying matters to her.

To balance impartiality and investment, we propose a third practice of embedded relationality, that considers partiality – which is not the opposite of impartiality – an inevitable consequence of being in relationship. Haraway's (1991: 191) understanding of "embedded relationality" is that it produces "partial, locatable, critical knowledges sustaining the possibility of webs of connection called solidarity in politics and shared conversations in epistemology." A practice of *embedded relationality* involves:

- Sometimes explicitly claiming the power granted by an insider-outsider perspective to interpret research material;
- At other times deferring to the interpretations of team members by virtue of their insider lived experience; and
- Most times, an engagement between researcher and team to enrich interpretation from both perspectives without resorting to lowest common denominator compromise.

If the positionality of a participant observer can never be interest-free, the alternative is to actively deal with the interests and power vested in their position. For this reason, we advocate identifying principles that can realize an ethics implicit to navigating positionality.

Anchoring principles

The three balancing acts and practices can serve as navigating instruments for a highly mobile approach to researcher positionality. However, this could still result in too many degrees of freedom. We therefore propose that researchers identify key principles that can act as anchors for their practice, securing a starting point and enabling movement within a certain circumference. The principles we found useful may not be as relevant to other researchers due to the singularity of each research situation.

We anchored our FAR practices in the following principles:

- *Congruence*: STS researchers have been criticised for repeating the epistemological or methodological 'mistakes' that they critique others for committing (Roth and Breuer, 2003). To be congruent in our FAR work, as it became increasingly focused on the difficulties of interdisciplinary collaboration, meant that our own research practice would have to pay particularly close attention to how we collaborated with others;
- *Sensitivity:* If we are studying projects and people in process, then "engaging with their becoming … affects the way we produce knowledge about things." (Puig de la Bellacasa, 2011: 100). According to Corbin & Strauss (2008: 41), sensitivity is derived from "immersion" in the research situation and hence being able to "…respond intellectually (and emotionally) to what is being said in the data…"..
- *Translucence*: Demands for greater transparency in research (Beaulieu 2010) represent a welcome (re)claiming of power by those who are researched, but transparency has become a cliché and thus lost the nuance of its meaning. There are also occasions that demand

some degree of opacity, for example when early research findings are too embryonic to be shared productively. We are in favour of a FAR *principle of translucence* that allows light through while certain shapes remain indistinct. For example, in the process of drafting this article, we presented our key ideas about FAR positionality to the Leverage Points research team for discussion and improvement.

The final part of this paper describes experiences of practicing FAR in the Leverage Points project. A series of three narratives, drawn from the research journal of the formative accompanying researcher, demonstrate how the balancing acts can work in practice for navigating positionality, providing some initial considerations for other STS researchers who aspire to advance collaborative research.

Producing situated knowledges: Three FAR narratives of navigation

The following narratives, presented in a chronological order, relate to experiences of moving between the three orientations of learning about, learning with and learning for a collaborative interdisciplinary team. Learning with and for a team opens up a messy world of possibilities, which the balancing acts can help to both anticipate and analyse. A particularly perplexing possibility appears where STS research and intervention meet (Zuiderent-Jerak and Jensen, 2007). The prospect of intervening can be both seductive and disorientating for an STS researcher (Hackett and Rhoten, 2011). Thus each FAR narrative provides a different window on our experiences of navigating positionality, when opportunities to intervene beckoned. The first narrative is an account of uninvited intervention. It demonstrates how the balancing acts (Figure 1) can be used as a heuristic instrument to track one's own navigation of positionality. The second and third narratives demonstrate more and less successful examples of navigating positionality, respectively, leading to reflections on the approach we have proposed in this article and what this implies for future research.

A situation of uninvited intervention

Six months into the FAR research, the formative accompanying researcher was observing a project management meeting. The nub of the discussion was about how to manage the consequences of making decisions, under resource constraints, that could trigger dynamics of inclusion and exclusion in the collaboration. Those present expressed acute concern about the impact on levels of happiness and trust in the team, while feeling pressure to take decisions. The discussion was open and those involved seemed unguarded and constructive in their exploration, but the meeting ended awkwardly, with an air of incompletion.

Cognisant that the dilemma had not been satisfactorily addressed and that the stakes were high, the formative accompanying researcher leaned forward from her position outside the circle of chairs and asked if she could speak "in the spirit of not only being an observer but also having a reflection role." After getting a clear yes, she did three things: First, she provided a perspective garnered from one-to-one interviews with team members (including all the people at the meeting), which had revealed a perceived ethos of goodwill and trust in the project, and which had been experienced as fostering creativity and productivity in the early stages of the collaboration. Second she posed a question to reframe the dilemma by saying: "If you knew that this ethos was a resource in the project, how could you handle this situation in a way that both assumes its availability, and continues to build it?" Third, she offered the opinion, that "each of us in the project is responsible for our own happiness."

This narrative demonstrates a FAR practice of dynamic proximity, with movement from one research position to another in response to considerations of care and investment. The primary move was from a position of learning *about* the team to learning *for* them, in support of the team. Prompted by a practice of *critical reflexivity*, it combined the roles of researcher-as-observer and researcher-as-participant by providing information gleaned from an exercise in *curiosity* (interviews) that only she had access to. And while it risked compromising perceptions of her as *impartial*, it prioritised the principle

of *translucence* in the face of an ethical concern (wellbeing and trust in the team). In this way, the formative accompanying researcher's intervention represented *sensitivity* to a critical juncture of the project. Where these movements lost balance and over-stepped the principle of *embedded relationality* was in expressing a personal opinion about happiness, which referred to 'us' from her perspective, rather than perspectives gathered from her research.

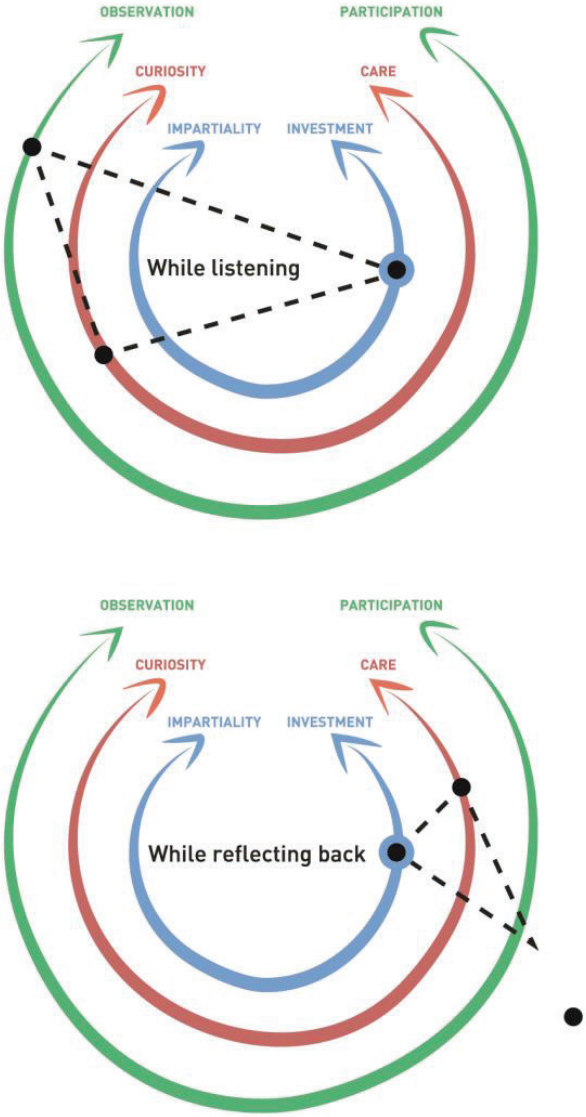

Figure 2: The balancing acts as a heuristic. Tracking dynamic FAR positionality while conducting participant observation. The top figure presents co-ordinates of the researcher's positionality while learning *about*. The bottom figure demonstrates how this changed when the researcher moved to learning *for*.

A situation of co-created intervention

Mid-way through the Leverage Points project, the team was in a transition phase from open and divergent explorations of its research question, towards needing to demonstrate progress and move towards convergent outcomes. Inevitably, this transition was creating some disruption, and team morale dipped. A team meeting came to a somewhat disgruntled close, making these dynamics more evident than they had been before, but remaining un-named. As her colleagues started to move towards the door, the formative accompanying researcher who was attending as a participant observer opened her mouth to name these dynamics and then closed it again. The timing was wrong to make an unsolicited observation.

Minutes later, a senior member of the team knocked on her office door. He was worried about the prevailing "heavy atmosphere"; was it possible to do something about it? After discussing the situation and some options to address it, the formative accompanying researcher approached one of the project managers to share with him insights arising from that discussion. Initially, he didn't agree that it was a team-wide issue, but rather a manifestation of academic stresses on individual members. The formative accompanying researcher countered his analysis, drawing on material from recent observations and interviews, which indicated that the project as a whole was grappling with the transition phase. The manager responded fast, immediately issuing an invitation to the team to attend an informal meeting to discuss reasons for low morale and how to address them. The ensuing meeting, co-facilitated by the manager and formative accompanying researcher, seemed to act as a pressure relief valve while also distributing responsibility for addressing sources of frustration among different members of the team.

In this situation, the formative accompanying researcher decided not to act on her concerns about morale until initiative had come from within the team itself. Because she had come to *care* about the team's wellbeing and was *invested* in the team navigating this transition well, she interpreted the knock on her door as a nudge to

intervene (i.e., to learn *for*) rather than as merely interesting information (i.e., learning *about*). However, she had to rein in a desire to 'rescue' the situation single-handedly. It proved much more effective to work alongside the manager to create a team experience of collectively making sense of the situation and reaching decisions about what was needed (i.e., learning *with*). The meeting itself was a further source of FAR data in which *curiosity and care* could continue to co-exist. In a concrete instance of being *translucent* but not transparent, the formative accompanying researcher produced two versions of the notes she took during the meeting; one for her own field notes and a less detailed record for the team, later distributed by the manager.

This co-created intervention demonstrated, in a very modest way, the potential to combine learning about, with and for a team, in the interests of advancing collaboration. It was one of several small initiatives that helped the team to move into the next phase of integration.

A situation of invited intervention

A few months later, the formative accompanying researcher was invited to join the integration team while one of the principal investigators was on maternity leave. She accepted with alacrity; her curiosity to learn *about* the team was starting to run dry and it was a relief to be asked to expand her role by actively contributing to project outcomes, learning *for* the team in its integration efforts.

However, taking on this new role restricted the formative accompanying researcher's fluidity of movement between different learning orientations. The integration role had hooked her in several ways; it called on her process facilitation expertise, activated her interest in the content of the collaboration's research, and triggered a sense of responsibility for ensuring successful project outcomes. She found it increasingly difficult to discern when to *observe* what was happening and when to intervene and attempt to address what was happening. It became clear to her that she was too close to the team and too static in her positionality, and that this was inhibiting her effectiveness in all three learning orientations. On several occasions, she felt that her sense of *care* for the team was crowding out her *curiosity* about the team. This experience suggests that learning *for* a team should be approached with caution.

Reflecting on these experiences, we see the following early indications of advantages and limitations of navigating positionality in the way we have proposed. We found the three orientations to learning – about, with and for – to be a powerful combination. Together, these orientations produced information *about* the collaboration, which fed into collective (although not necessarily consensus-based) understanding and insight *with* the team, which served as a resource *for* the collaborative work, enabling the team to learn and adapt *in situ*. Moreover, the proposed balancing acts served as a useful heuristic device to monitor and navigate positionality at any given moment, and over time. A collaborative research project constantly evolves through different phases, and the FAR role has to adapt alongside these changes. The practice of embedded relationality helped to track what was happening, both in the team and between the formative accompanying researcher and the team. The practice of critical reflexivity enabled seeing what this implied for FAR positionality, and the practice of dynamic proximity guided next movements in response. The temptation to intervene was very strong. We learned, through trial and error, the value of maintaining tension between the three learning orientations instead of overbalancing into intervention.

Conclusion: FAR's prospective contribution to interdisciplinary collaboration

This article took as its starting point that there is a growing demand for and interest in interdisciplinary research, but that this kind of work is difficult and there remains a lack of empirical study to bolster its practice. Such a situation can be described as constituting risk for interdisciplinary collaboration. As stated by Callard et al. (2015: 6),"Interdisciplinarity is necessarily and irrevocably a practice that entwines bodies, minds, geographies and temporalities in creative, ambivalent and often conflictual ways. The point of tracking the signal and tracing the noise of its explicit and

not-so-explicit contours is precisely to do justice to these dynamics." The question of how to do justice to these dynamics is key. Our approach to positionality is designed to enable a formative accompanying researcher to learn *about, with* and *for* interdisciplinary collaboration, exploring its explicit and not-so-explicit contours of success and challenge. The dynamic positionality we developed combines multiple aims. Beside a more conventional researcher positionality that allows for empirically analysing an interdisciplinary team, the FAR methodology implies learning *with* the team, paying collective attention - especially where there is difference, ambivalence and conflict that could threaten collaboration. This dimension of FAR bears the possibility for interdisciplinary research teams to reflexively learn how to collaborate while collaborating (Freeth and Caniglia, 2019). Finally, FAR also includes the possibility to learn *for* the team to support it to address identified difficulties through an intervention.

What we have not addressed in this article is the possible range of relationships of a formative accompanying researcher to the content of what the collaborative team is studying. If a sense of curiosity and investment are turned not just towards the researchers, but also towards their research questions, this has further implications for positionality. STS researchers engaged in interdisciplinary projects in the fields of synthetic biology (e.g. Calvert and Martin, 2009), neuroscience (Callard and Fitzgerald, 2015) and nanotechnology (Viseu, 2015) have addressed this, but there has been little focus yet on the interdisciplinary field of sustainability.

After developing FAR in the context of the Leverage Points project, a vital question remains open at this stage: Can a formative accompanying researcher advance collaboration? While we see small positive indications of this, for instance in the second narrative of co-created intervention, we also see the pitfalls of intervention. In the next phase of our research, we will conduct ex-post analysis to investigate whether the FAR approach has significantly advanced collaborative interdisciplinary research in the Leverage Points project, as the project draws to a close. What we can claim already is that we have learned something useful about how to navigate positionality by adopting a particular presence and set of practices, guided by a "no-nonsense" (Haraway, 1991: 197) brand of congruence, sensitivity and translucence. This, we argue, will contribute to an STS research practice that can fruitfully "track the signal and trace the noise" (Callard et al. 2015: 6) of interdisciplinary collaborations amid a cacophony of signals, noises, distractions and demands.

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