Conceptualising Doing Things: The Experience of Collaboration for Community Groups and Academics while Addressing Environmental Justice

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Abstract

What happens when academics, who 'conceptualise research questions', and community groups, which aim to be 'doing things', collaborate? Building on science and technology studies research about collaboration, we focus on the collaborative experiences of teams of academics and community groups to address environmental justice. Our research reveals a tension between the way the two sets of actors understand the purpose and mode of science within environmental justice collaborations. We explain this tension by exploring the motivations of the academics and community group managers and by how team members arrived at a shared understanding of collaboration itself. Our findings reveal that the purpose and mode of science within the collaborations that unfolded can best be understood not as conceptualising research questions or doing things, but rather as 'conceptualising doing things'. Recognising this merged understanding of science could be beneficial in enhancing and accelerating the work of community group-academic collaborations labouring together to address environmental justice challenges.

Keywords: Collaboration, Environmental Justice, Academics, Community Groups, Field Theory, Research Questions

Introduction

> Collaboration, to me, is a hotpot or picnic or a stew…each person brings something to the table and then you try to make a dish out of it.

With this tasty reflection during an interview, a project manager for Trees Matter helped us frame how we can think about collaboration between community groups and academics.[1] Trees Matter participated in one of the collaborations

within Project Confluence, a study and intervention we conducted to explore the interactions between community groups and academics as they address issues of environmental justice in Phoenix, Arizona. Convivial metaphors aside, scientific engagement with the wider community beyond the confines of the laboratory or the classroom has long been an important topic in the social studies of science (Michael, 2002; Leach et al., 2005; Morris and Hebden, 2008). At times, an important piece missing from these studies is how collaborators experience this kind of engagement, or "the stories that try to capture what it feels like when participation happens" (Kelty, 2019: 9). Thus, for this project manager, that story can be described as a hotpot-like experience of interacting with academics and her fellow community group members.

The research question guiding our work is, *What are the experiences of community groups and academics collaborating to address environmental justice challenges?* We provide a narrative account of the tension within collaborations between (a) implementing a project to address a challenge, and (b) conceptualising a research question to better understand that challenge. Our observations and interviews of the teams involved in our intervention have helped us think through what conducting engineering, technical, and scientific work[2] means within such collaborations and what these insights might hold for future collaborations that desire to address issues of environmental justice.

Although often rejected by science and technology studies (STS) scholars, what is perceived as 'science ' is often premised on the idea of formulating and testing hypotheses or searching for answers to research questions. This focus on research questions as a key element of the scientific method comes from a positivist interpretation of knowledge as 'scientific' if it has established "formal relations between theories and data, whether through the rational construction of theoretical edifices on top of empirical data or the rational dismissal of theories on the basis of empirical data" (Sismondo, 2010: 6). Applied research design begins with a first stage of defining a research question, a second stage of designing a research plan, and then a third stage of executing the plan that would help answer the research question (Bickman and Rog, 2009). Thus, we understand collaboration to be a mode by which interdisciplinary community science is organised and conducted to implement applied research. However, we found that the literature has yet to explain what the experience of collaboration means for the practice of science.

We discovered the idea of 'making and doing' science (Downey and Zuiderent-Jerak, 2016) emerged as a central component to the collaborations explored in this intervention. However, as we will also see, it may be best to think of 'making and doing' in parallel or on a continuum with the kind of theorisation that we tend to associate with conceptualising research questions. With this article we want to ethnographically unpack how collaborations transition from a set of diverse but ambiguous social relationships to a focus on 'making and doing'. After providing a framing for our study and an introduction to our intervention, we first analytically explore the drivers, inputs, and outputs of the community group and academic collaborators. Then we consider what collaboration meant to each team and how the team members arrived at a shared understanding of collaboration. Finally, we will discuss how collaborators understand the relationship between 'doing things' and 'conceptualising research questions' within the teams.

Labouring together

For Project Confluence, we—the authors of this paper—have defined 'collaboration' to mean community groups 'labouring together' with academics to address an environmental justice challenge. Labouring together includes the work, communication and exchange of knowledge that occurs when these two sets of actors are finding solutions to these challenges. While this is the way collaboration has operated within Project Confluence, the interactions we have observed between team members also reflects a co-produced and emergent understanding of participatory research (Chilvers and Kearnes, 2015). The emphasis on labouring together in this definition is also important because it signifies a "basic individualism that must be overcome, a sense of bringing

together what is separate, or of placing side by side" (Kelty, 2019: 31). However, as the reader will see, a shared understanding of collaboration was negotiated by those who laboured together in our intervention. Part of that negotiation was deeply influenced by diverse understandings of how science supports conceptualising research questions or placing knowledge into practice to address social problems.

Previous social studies of collaboration in science have focused on the interactions of groups of academics (Cummings and Kiesler, 2005; Balmer et al., 2015), which more recently has been described as 'team science' (Tebes, 2018). STS has noted how collaborations navigate language, concepts and knowledge integration across different disciplines (Jeffrey, 2003; Rival, 2014) and explored cross-sectoral scientific collaborations (Garrett-Jones et al., 2005). More recently, critical analysis has been conducted on interventions within action-oriented STS (Zuiderent-Jerak and Jensen, 2007), citizen science collaborations like Bucket Brigades (Ottinger, 2010) as well as virtual engagements found on digital platforms (Baudry et al., 2022).

The four community groups at the heart of Project Confluence are motivated by addressing environmental, climate and energy injustice. Such challenges are often tied to poverty, race, and a lack of technical resources (Mohai et al., 2009), which are concerns for each of the teams. There are many studies of collaborations between academics and community groups addressing environmental justice (Davis and Ramírez-Andreotta, 2021; Yuen et al., 2015), and often, they are framed as evaluations of community-based participatory research (Burwell-Naney, 2017; Lantz et al., 2001). Rather than an evaluation, in this paper we explore ethnographically how these two different kinds of actors—community group managers and academics—experience collaboration while addressing issues of environmental justice. So, unless otherwise noted, when we are discussing collaborations, it will be in the context of collaborations between community groups and academics.

Within STS literature there are also four elements, namely community leadership, interdisciplinarity, flexibility, and building trust, which are important for framing both the collaborations within Project Confluence and those that address environmental justice in general. For instance, with regard to leadership, community members are often already at the forefront of environmental justice issues, such as the activist work conducted by Deborah Thomas on fracking in collaboration with academics like Sara Wylie (Thomas, 2017). At times the leadership of community members can even be surprising for us as analysts within a collaboration. As we attempt to both engage with our collaborators and learn from them, they can change or adapt the project in unforeseen ways (Downey and Zuiderent-Jerak, 2016). Interdisciplinarity is central to addressing issues of environmental justice and community groups are often searching for diverse forms of expertise to support their organisational goals (Macias et al., 2022). Team science has been considered as an interdisciplinary approach to addressing environmental justice issues (Wallerstein et al., 2019). The interdisciplinarity inherent in community science is a better fit for ensuring community members are centred within collaborations. Further, as a form of community-based participatory research (CBPR), community science highlights the "formal and informal educational experiences of community members" (Carrera et al., 2019: 3). Community science was initially identified as distinct from other forms of CBPR because of its focus on improving the quality of life of a given community (Wandersman, 2003). Additionally, community science recognises that community members have the agency and interest to engage in science in the service of their community (Adams, 2012). Collaborative environmental justice work also tends to require time and space for community members to define how their local environmental challenge is understood. As some have noted, research oriented towards addressing such challenges should support the labour of communities by "applying flexible methods responsive to local contexts" (Allacci and Magder, 2014: 39). Finally, building trust is essential for ensuring that collaborations can provide benefit to the community that is most directly affected by the process of an intervention and its outcome (Brown et al., 2012). There are many examples of academics exploiting communities through collaboration

in order to further their own interests, however well-meaning, through damage-centred research (Tuck, 2009; Carrera and Key, 2021). Overall, environmental justice collaborations try to ensure that community leadership is valued, that a community science approach organises interdisciplinarity in the collaboration, that methods are flexible to the challenges faced by the community, and that relationships between collaborators are built upon trust.

Because of the direct connection to environmental justice and the reflexive nature of our study, it is necessary to properly locate this research within a theoretical framework that may be considered heterodoxic within some interpretations of STS. Environmental justice collaborations are inherently activist and therefore politically motivated to use science to improve the well-being of their local community. Social justice theory has recently been recognised as a normative way to approach long standing questions within STS (Sovacool and Hess, 2017). While agency-based frameworks have noted that topics such as the interests and motivations of scientists may be irrelevant to why a scientific theory becomes dominant (Callon and Law, 1982; Wynne, 1992) such frameworks are "less well-suited to study the problem of the ideological valences of the intellectual field" (Hess, 2013: 186). With this in mind we draw primarily from field theory in order to balance our explanations of how social structure, agency, and systems of meaning can influence—or motivate—a participant's experience within an environmental justice collaboration (Bourdieu, 1975).

Studying an intervention

Project Confluence implemented a hybrid research approach (Schmitt et al., 2022) to create an umbrella of funding and networking that reflects the continued complex evolution of the interaction between the university and society (Tuunainen and Kantasalmi, 2017). This hybrid research approach allowed us to both centre the challenges faced by the community groups that were actively searching for support from academics, while also giving us an opportunity to explore how these actors experience collaboration. Building upon Liboiron's notion of anticolonial approaches to science, the hybrid approach of Project Confluence also required us to consider the *how* of science through "a genre of relationality based in obligation" (Liboiron, 2021:120). In order to properly integrate our research within an environmental justice approach, our obligation as researchers is to take the words and actions of our participants seriously so that we can properly understand how science works in their community. In this sense, science is constituted by relationships, as is commonly understood within STS literature, and "accountability is the way to describe that constitution" (Liboiron, 2021: 121).

Although Project Confluence was designed to allow us to study the evolution of collaboration between community groups and academics, our interventionist framing is quite similar to the collaboration between social scientists and medical physics researchers analysed by Morris and Hebden (2008), which suggests that there is benefit both to research outcomes and for participants when our research design and approach is more reflective and attentive to the perspective of our interlocutors. In this sense, our methodological approach to data collection and interpretation that is described below is heavily influenced by anthropology, which at least in the past three decades of studying environmental justice has properly recognised the obligation we have to those we research (Johnston, 1994; Fortun, 2001).

For Project Confluence, we organised four collaborative teams between community groups and academics. We first contacted 28 community groups focused on addressing environmental, climate and energy injustice issues in Phoenix and then workshopped the most pressing challenge faced by each organisation looking for academic support. In the end, we selected four community groups and their scientific, engineering, and/or technical challenge morphed over time to become the focus of the teams, as discussed in Table 1.

Fifty-one academics were contacted with an introduction to one of the four community groups and a description of the challenge they wished to address. While eleven academics initially agreed to join the projects, three quickly had to withdraw due to time conflicts. Later the OCLC

Table 1. Details on community groups collaborating in Project Confluence

Community Group	Community Group Mission	Challenge Identified
Arizona Faith Network (AFN)	Inviting people into meaningful relationships, shared prayer and dialogue rooted in our faith traditions, and actions that influence public awareness, engagement and policy.	Design a coalition to coordinate faith-based cooling centres in response to the extreme heat events
Trees Matter	The Valley has an immediate need for an increased tree canopy; Trees Matter works to alleviate this need by educating the public on tree knowledge, and distributing desert-adapted shade trees to residents across the Valley.	Create a digital platform through which the general public can interact with their local canopy.
Orchard Community Learning Center (OCLC)	Creating a flourishing local food system by supporting Phoenix growers. Part of the Spaces of Opportunity partnership, to enable all Phoenix families to have affordable access to healthy food, active living and connection to their cultures.	Develop an efficient irrigation system design for improved water resources management at the Spaces of Opportunity community farm and incubator.
Indigenous Vision	Indigenous Vision works to revitalise Indigenous communities – culture, people, and land – by providing educational resources through quality programs that promote well-being.	Building a map and database of pollution/land degradation on Indigenous land in North America

team added two undergraduate students and the AFN team incorporated a graduate student. We provide details on each participant's expertise and previous experiences collaborating in Appendix A. Importantly, Indigenous Vision withdrew from Project Confluence before the first deliverable (the memorandum of collaboration; described below) was due, but after the first interviews were conducted (also discussed below). While Indigenous Vision mentioned their withdrawal was because of a lack of available time on their part, we do not have empirical material to fully determine exactly why they withdrew. (As is evident from our results and discussion, we recognise that participation or withdrawal depends on whether it is possible to find common grounds for collaboration so that it will lead to a benefit for all engaged.)

We required the teams to complete two major deliverables between May 2021 and January 2022, the requirements for which we designed. First, they had to establish a *memorandum of collaboration* (MOC; Fawcett et al., 2000), to define the goals of the team, roles, responsibilities, participatory processes for decision-making, maintaining trust, how conflicts could be resolved, data collection and management, codes of conduct, and details on ownership of work. The MOC requirement was inspired by the idea of a 'memorandum of understanding' that is created to articulate the aspirations and norms between different parties (organizations or individuals) and guide their relationship.

We believed the MOC would be critical for collaborators to meet the second required milestone, the creation of a *collaborative challenge assessment* (CCA). Intended to be collaboratively created, we envisioned the CCA as a product that would assess and plan a roadmap to address the community group's challenge (Schmitt et al., 2022). Inspired by 'technology needs assessments' (Haselip et al., 2019), we intentionally steered away from the word 'needs' because of its 'deficit' connotation and encouraged participants to draw upon an asset-based approach (Mathie and Cunningham, 2003). We suggested that the CCA should answer at least three questions: (1) What must be accomplished to address the challenge identified by the community group? (2) Why? (3) How might things get done, and using what resources? Given the nature of community-based work and our intention to not be overly prescriptive, we encouraged teams to allow the CCA to take whatever form made the most sense for the

community group, whether a formal document, a presentation, or even a pitch for fundraising.

Further, to aid in the creation of the MOC and the CCA, we provided the teams a budget of $10,000 (through the grant that supported this work; see Acknowledgements) that they could use for things like data collection, purchases, hiring student researchers, or other costs that would be incurred by the teams.

Monthly All-Hands Meetings—in which all participants from all teams would be present, and which lasted one hour—began on May 19th, 2021 to facilitate inter-team connections, with all but one conducted via Zoom. Additionally, monthly team meetings, which also lasted one hour and were conducted by Zoom, were scheduled with each of the teams to facilitate the completion of the deliverables. We balanced between being facilitators, participants and observers within in these meetings. This helped us obtain an ethnographic level of detail on the interactions between the collaborators (Bernard, 2011: 260-264). Detailed notes were taken during each of these meetings and summaries were shared with all the collaborators. Occasionally we would record these meetings and transcripts were prepared for analysis. We discuss some of these meetings below in more detail.

Initial semi-structured interviews were conducted with all of the participants (six community group leaders and 11 academics; *n* = 17; see Appendix A; three academics were on two teams)[3] at the beginning of the collaboration. We included questions that were directly related to the participant's personal background, their experience with collaboration and addressing issues of environmental injustice. Interviews were conducted and recorded via Zoom.

Following a close analysis of the initial interviews as well as the ongoing discussions in the All-Hands and Monthly Team Meetings, we designed a follow-up interview protocol that aimed to answer remaining gaps of information that would support our analysis. This included questions about the importance of the social impact of research, the meaning and value of collaboration, and changes of participants' views on collaboration. As some collaborators had withdrawn due to time conflicts, we conducted 13 follow-up interviews[4] with all remaining participants, which were recorded through Zoom. We drew upon a qualitative data analytical approach to explore the major themes that emerged from the interviews (Miles et al., 2014). This analytical approach has resonance with grounded theory (Strauss and Corbin, 1998) approaches in STS because it guides us towards concepts used by "the agents under study" (Fuller, 2006: 49).

In the following sections we will explore the way the teams experienced collaboration through their responses during interviews as well as analysis of discourse and observations of interactions within the meetings.

Motivating and facilitating collaboration: Funding, time, and the currency of collaboration

Through our observations and interviews we discovered that an important part of the experience of collaboration is team formation and that often hinges on what motivated each individual collaborator to become part of a team, and what facilitates collaboration. This included topics that are familiar issues in collaboration: funding and time. For instance, our interview with an Assistant Professor of Sustainable Engineering at Arizona State University (ASU) provides a good example of one aspect that facilitated her collaboration with OCLC during Project Confluence. When we asked her what she felt moved her relationship forward in their collaboration, she replied:

> So, I think it's always easier for me when there's funding involved. Because for me funding is equivalent to responsibility, because that's just how engineering is…we do our work based on funding. Unfortunately, I don't really have time to do things that I don't have money for. There are lots of things I would love to do but don't have time for.

Fundraising is considered critical to one's success within engineering disciplines in the field of academia. At the same time, as with other pressing social challenges, within the environmental justice world and the field of community group work, funding and time are important examples of what facilitates collaboration. When we asked the Executive Director of OCLC, who is also a retired

elementary school principal, how academic work is valued in collaborations he said:

> Well, I think everything should be compensated in some way. Because just plain volunteering…I mean that's what I do. My life is volunteer now. But it's not sustainable for making change. So there needs to be compensation. But ultimately the thing that we need to be confronting is the capitalist way of compensating. We need social enterprise, cooperatives and hyperlocal economies.

In other words, while money is necessary for collaboration, that does not mean a collaboration has to be organised in a corporate or even a capitalistic manner. While some are already concerned about how corporations might be appropriating the work done within collaborations (Blacker et al., 2021), alternative models for financing this collaborative labour needs to be considered. For instance, Sandy Smith-Nonini (2016) reflects on the balance she needed between research and activism that led her to establish a social enterprise for creative reuse called Eco-Cycle. Eco-Cycle also faced a number of financial challenges to ensure those involved in the collaboration could receive proper compensation for their time.

This then raises an additional question about the kind of timeframe that collaborations can integrate into their strategy. Some environmental justice issues are more urgent than others and that sense of urgency can act as a prime motivator. For instance, the AFN team needed to find a better way to coordinate the organisation of cooling centres as quickly as possible because people are dying every year during heatwaves in the region (Iverson et al., 2020). In contrast, the digital platform for engaging with trees was conceptualised some time ago by the Executive Director of Trees Matter, but before joining Project Confluence it was not something the community group felt needed to be done right away.

An academic collaborator with Trees Matter is a Professor of Practice with expertise in citizen science at ASU and she compared the importance of time for community groups with the way that academics tend to approach time in science. When we asked her what she found odd about the way academia operates she mentioned that for most academics it "seems like time doesn't matter much", but for community groups:

> There's a sense of urgency with the smaller organisations…the mission of what they're doing, it can't wait. It doesn't have 10 years. They don't have that luxury of being unconcerned with time and getting things done.

Other researchers have demonstrated how different timeframes of funding agencies, academics, and community members can create serious barriers for projects like urban gardens that otherwise can have a transformative impact on local issues of environmental justice (Kotsila et al., 2020). So, time is a facilitator for collaboration in the sense that if time availability is not well balanced among collaborators it can negatively affect the outcome of a collaboration.

That last quote also touched what we discovered to be the most important motivator for collaboration, which is the desire to be doing things or as the Professor of Practice put it "getting things done". Although in our initial interviews we did not ask a question specifically about why Project Confluence participants wanted to join a collaboration, we discovered a similar theme across a variety of responses: that the collaborators within Project Confluence had self-selected to participate because of a desire to make their professional work relevant to a local community. This finding is similar to the commitment found among DIY Makers communities engaged in environmental projects described by Berglund and Kohtala (2020). Others have described the desire for academics interested in collaboration and being more connected to society and local community groups as 'research altruism' (Carrera et al., 2018).

During one line of questioning about what was unique about the Project Confluence approach, the Director for Data Science and Analytics in the ASU library described to us a concept that we find central to understanding the facilitation of individual collaborators: the "currency of collaboration". His job is to help faculty and students from the humanities, social sciences and engineering obtain the computational resources and knowledge they need to conduct analysis on complex organisations, social media, and linguistics. At the very end of the initial interview conducted with him in April 2021, he posed this idea to us as such:

> I'm in a really non-traditional position: I have a faculty appointment, but I'm also in the library. So, I don't have the same requirement as a research faculty member would have to sponsor their salary through grants. And that means their incentive structure is to apply for grants. Tenure-track faculty are evaluated on their publication record, so they're incentivised to publish articles. I am personally and professionally incentivised to help people. So, [working with Project Confluence] I feel like the currency of collaboration, for me, is…collaborating! That I get to do this is a good thing for me. But I can't pretend it would be simple to try to balance folks who have one currency of collaboration against so many others where money, publications, and reputation are all bouncing around.

The concept of 'currency' opened up our analysis for considering what facilitates collaboration and what that can mean for science in general. In this sense, currency could be thought of as the kind of social and academic capital that could structure a future field of collaboration for addressing issues of environmental justice (Boucher et al., 2020). Additionally, currencies of collaboration can help explain the potential for tension that Jalbert et al. (2021) described for academics engaging with citizen concerns about helium extraction in Arizona. In that case, the relationship building that was necessary to ensure a successful collaboration did not always fit well with the need for the academics to publish peer-reviewed articles based on their research.

Throughout our study, we found that the currency of collaboration was often tied to a motivation for 'doing things' for the community. Here for instance is what one Assistant Professor of Civil and Environmental Engineering at the University of California-Merced[5] said when we asked him to describe his work as an academic:

> Well, actually that was one of the things I found most exciting about Project Confluence. For a little while now, I've recognised there is a disconnect between my work and stuff on the ground…I can have a good idea of what the key issues and problems are, and I can model it, but I think I need a stronger feedback to the people that are actually on the ground. Especially since my work is related to cities and infrastructure, these are things that people are interacting with and using on a day-to-day basis. Trying to find a way to have a stronger community or co-production element is something that moving forward is a key area for me to develop.

The academics who participated in Project Confluence described their interest in collaboration using very similar framings about co-production and providing research that benefits people "actually on the ground", which could be interpreted as a form of 'research altruism' (Carrera et al., 2018).

The interest in putting science to work to 'do things' ties together the examples that emerged from our interviews, which fits very neatly into the STS analytical frame of "making and doing" (Downey and Zuiderent-Jerak, 2016). For instance, when we asked the project manager from Trees Matter about how the work done by community groups is valued in collaborations, she said:

> The mutual benefit obviously for us is getting the knowledge and the know how that we honestly would have to contract out otherwise. So, that's very valuable for us…[Academics] need to have a connection to the real world…if they need that connection that's something that we can provide… the thing of interest is definitely to be able to see the research used in an applied real-life setting.

It is important to note the institutional context provided by ASU because it influences how academics engage in their disciplines. ASU's charter states,

> ASU is a comprehensive public research university, measured not by whom it excludes, but by whom it includes and how they succeed; *advancing research and discovery of public value; and assuming fundamental responsibility for the economic, social, cultural and overall health of the communities it serves* (emphasis added).

The fields within which the academics at ASU work are shaped by the charter and thus can help explain their interest in academic work that benefits people. The fact that 'doing things' was so central to collaboration, however, was not so obvious to everyone right from the start, least of all academics who also face a currency of collaboration that emphasises research that may drive an academic field forward rather than creating

knowledge for accomplishing a socially-relevant task. In the next section we will explore how the experience of collaboration guided collaborators towards a shared understanding that collaboration as a form of community science was about 'doing things' rather than 'conceptualising research questions'.

Reaching a shared understanding of collaboration

In our introduction, the project manager at Trees Matter provided us with a fun food metaphor for considering how diverse individuals from community groups and academics labour together within a collaboration. Directly after providing us with that metaphor, she said:

> In more professional terms, collaboration is bringing together several different individuals that have different talents, networks and resources, and then trying to create a product or an outcome from the combination of those resources.

We see that collaboration is about 'creating a product' rather than asking a research question to obtain more knowledge. However, this definition was also provided to us after the members of the Trees Matter team had spent six months labouring together. There was a process where the idea of what they were doing within the collaboration became clearer to everyone on the team. We frame this as a moment of a change in understanding and a process of reaching a shared understanding about what collaboration meant to the team. While we know that diversity within a team can often stimulate opportunities for obtaining new understandings and greater equity across groups (Bang and Vossoughi, 2016), our ability to see a change in understanding take place during the integrating of different viewpoints and approaches is difficult, as it could occur during any stage of a collaboration. Hall and Horn (2012) were able to demonstrate that this kind of change was occurring when collaborative production was suspended while participants debated a point of contention in their labour. Because a change in understanding is more visible in the midst of contention, it is important for us to explore in detail two ethnographic moments that led to a shared understanding of how collaboration came to mean 'doing things' to the teams.

"Do we just pull the trigger?"[6]

A first example comes from the Trees Matter team during a monthly team meeting on August 20th, 2021, which included the Executive Director of Trees Matter, the project manager of Trees Matter, the Professor of Practice with expertise in citizen science from ASU and a research librarian also with expertise in citizen science from ASU. The team was trying to complete their first deliverable, the MOC. But across multiple previous meetings they had struggled to articulate how the goal of the collaboration would emerge from their CCA: while they knew the desired long-term goal would be a digital platform for helping community members engage more with trees in Phoenix and beyond, they were not quite sure what they would do in the following months that would contribute towards that product. At this point in the meeting, the team had been working for about 35 minutes on detailing what the milestones in their project would be and then who would be responsible for implementing each step. But there was still a lack of clarity on the purpose of the CCA, which is when the Research Librarian on the team said, "I think a problem is that in these meetings we keep getting distracted with starting and stopping conversations, and we just gotta keep it moving a bit".

This statement led to a long pause within the group. There was a palpable tension because everyone was now reflecting on whether the conversation was heading in the right direction. No one wanted to feel like they were wasting anyone's time, which created a moment of contention. The Executive Director then returned to a topic where it appeared everyone agreed:

> *Executive Director*: So just to come back to this point again, I want to make sure we are all on the same page that the CCA should be a pitch?
>
> *Project Manager*: Agreed, it makes sense.
>
> *Research Librarian*: Working with the elementary school might also be good in this regard, especially if you are ever interested in pitching to other schools or pitching ideas to parks departments. It sounds like a goal to me.

Now at this point the team was at least on surer footing. There had now been verbal consent that a pitch was the right way forward. An opening had been made for the participants to explain their own thinking on how they typically approach problems in their work.

Directly after this the Executive Director continued by explaining how community groups typically operate:

> *Executive Director*: Some community groups are ready to do implementation. We usually do the implementation. But here in Project Confluence we have the opportunity to think through that implementation first and make it as useful as it can be.
>
> *Professor of Practice*: Just as an aside, it might be interesting to think about what would happen without us academics involved.
>
> *Project Manager*: Well, usually we are more action-oriented. You learn on the way. It is a bit like learning to build an airplane while flying.

This period of consultation within the team regarding what it was that they planned to do in the collaboration helped the academics understand the expectations of the community group organisers. Although this moment was slightly awkward, it gave the organisers the space to clarify how the community group was typically focused on 'doing things', and that they also understood how the collaboration could give them the opportunity to conceptualise their project before jumping into implementing it. Thus, the team changed from a poorly articulated understanding of collaboration to a shared understanding that their collaboration could focus on 'doing things'. They were then able to quickly organise their milestones and end the meeting. Everyone agreed to meet the following week to finish writing the MOC.

At this second meeting, they began right away reflecting upon this moment of a change in understanding that occurred the week before:

> *Research Librarian*: Last week, I remember hearing Trees Matter saying they were not used to working in this way, they were used to just going…We've identified the need. Do we just pull the trigger?
>
> *Project Manager*: Well, we are not going to build the platform now. But there are definitely action items in the MOC. It feels like a roundabout way to do things. I'm ready to go. I want to collaborate.
>
> *Executive Director*: Maybe we can just work on the milestones.
>
> *Project Manager*: Yeah, we have had many meetings about it, maybe we just do it.

Now we can see that the team has reached a shared understanding of what collaboration is about in the context of their environmental justice challenge. This allows everyone to feel comfortable about "pulling the trigger" rather than being too concerned with conceptualising a plan or research questions. The project manager was able to explain that even the conceptualising that went into the MOC was a roundabout way to do things.

While it would appear in this case that the Trees Matter team was strongly influenced by the way community groups operate, it is also true that this change in understanding influenced individuals like the project manager by making them more aware of how academics operate. In her follow-up interview, while reflecting on the moments when her understanding of collaboration changed during Project Confluence, the project manager informed us that:

> I realised, Okay, I'm still trying to use the mindset that I usually use. That was probably the meeting right before we set deadlines for our milestones. After I realised that this was a different style of collaboration than we are usually in, it was a lot easier to facilitate and move forward with the project after that.

So, while the collaboration became more about 'doing things', which was closer to the project manager's understanding of collaboration, it was after the team arrived at a shared understanding among all the collaborators that their collaboration became "easier to facilitate and move forward". Thus, the experience of collaboration is one of reaching a shared understanding in order for the collective to move beyond the assumptions and expectations held by the diverse individuals within the team. In this case it landed the team comfortably where 'doing things' was

more important than 'conceptualising research questions'.

"Let's just go do it"

This is not to say that once a team reaches a shared understanding of collaboration focused on 'doing things' that they will no longer be affected by academic concerns. This became quite obvious during another moment of a change in understanding for the AFN team. While working on their CCA, the team discovered that they would like to conduct interviews with managers of cooling centres in vulnerable communities across the United States. They wanted to discover what kind of diverse management practices were being used that may or may not be dependent upon faith-based organisations. To conduct these interviews, they hired a Public Administration graduate student at ASU who had worked with the Executive Director of AFN and an Assistant Research Professor of Sustainability at ASU during the summer of 2021. The graduate student had done similar interviewing before as an undergraduate student and felt comfortable preparing the materials for the ASU Institutional Review Board (IRB), which approves human subjects research.

On Dec. 2nd, 2021, during a monthly meeting to discuss details about submitting materials to the IRB, we observed a change in understanding occur within the AFN team. As the meeting began, the graduate student explained that after the revisions were completed, there was a miscommunication with the professor that led to a delay in the materials getting submitted to the IRB. At this point, the Executive Director stimulated an important discussion by asking:

> *Executive Director*: Is there even a need to do an IRB if we are not planning on publishing our results?
>
> *Graduate Student*: Well, overall IRB is an ethical review that is important for any social science project to undergo so that we ensure the human subjects within our study will not be harmed in any way.
>
> *Executive Director*: Absolutely, I understand the important role they play. But if we know for certain that the research will have a benefit to a vulnerable community and won't harm those we study…I mean in the NGO world we would say "let's just go do it".
>
> *Assistant Research Professor*: Yes, I appreciate your enthusiasm. At the same time, if we want the government to pay attention to us, then we need an IRB and we need a paper.

A degree of contention was felt over the necessity of engaging with an IRB in the process of trying to support the needs of vulnerable communities during a heatwave. The problematic nature of IRBs and informed consent have long been discussed by fieldworkers (Lederman, 2006; Bell, 2014), which reflects the Executive Director's concern that an ethical review may not be expedient if it prevents vulnerable communities from benefiting from their research; within the field of community group work, IRBs are not necessary. The assistant research professor, however, brings the norms of academia to bear on the topic by arguing that their research will have more legitimacy and more potential to stimulate change if they can publish a paper, which cannot be done without submitting materials to an IRB. Demonstrating a change in understanding, the Executive Director then said, "That makes sense because I understand people can learn from our paper in the future and it gives our recommendations more authority. And will these interviews help us explain to the government what is needed to support cooling centres in Phoenix, whether that be a new NGO or something else?"

During this change in understanding, the Executive Director is acquiescing to the important role that academic infrastructures, such as IRB and peer-reviewed publishing, can play within a collaboration. Note, however, that this ethnographic moment is not about obtaining IRB approval to conduct interviews simply to answer a research question. Ultimately, the interviews are important to influence the creation (or not) of a new specialised NGO that can support cooling-centres in Phoenix. The peer-reviewed publication is to influence the government to change their policy. This moment of a change in understanding has still led the team towards 'doing things', and research questions that could influence the interviews have faded into the background of this discussion.

It is also worth exploring how this moment of a change in understanding was explained by the Executive Director to all of the Project Confluence participants during an All-Hands Meeting on December 8th, 2021.

> Last week, we didn't even work on the CCA that much because we were…trying to figure out how to address this issue about the IRB. I definitely gave the feedback that this process is ridiculous if we're actually trying to prevent people from dying. And while I could see on some level that it is needed and I'm glad we did it…I was asking the question of how long is this going to take. Because at the end of the day, as community-based organisations that are trying to respond to immediate community needs, if we're going to be spending four months waiting for some stuffy old committee to give their rubber stamp of approval so we can ask the dang questions to get the data that we need to actually prevent people from getting sick or dying next summer…I'm going to just say…forget it. Let's go do what we need to do.

The Executive Director emphasised that the need for community groups to focus on the day-to-day level of urgency that their small organisation faces forces them to centre their activities upon 'doing things'. The academic institutions of IRB and peer-review were designed primarily within the field of academia where 'conceptualising research questions' is the dominant approach, which potentially makes those institutions inadequate for a science that is focused on 'doing things'.

This exchange highlights how the tension over IRB and peer-review publishing led to a change in understanding within the AFN team's collaboration that refocused their efforts upon 'doing things'. It also points out, though, that academic institutions can return to influence collaboration even if they appear to be operating along the norms of a community group. This raises a point about how or where conceptualisation and research questions might play a role in these collaborations. In fact, right after the Executive Director raised her question about how much data they are missing out on, the engineering professor from University of California-Merced spoke up with this point by drawing upon the AFN team's experience:

> I agree that the interviews currently are our main scientific motor. But I think…interview results will point us in the direction of some additional scientific measurements or data that could be collected. So, just based on, for example, some of the questions that we asked the respondents to indicate what information would be helpful or what improvements would they like to see and how their cooling centres are administered…I think the answers could steer us in a good direction for saying, for instance, "Okay, we need to go measure heat vulnerability in these populations". So, there are a few potential avenues for addressing future questions that I can see emerging already.

Thus, the engineering professor opened up a new role for research questions—a key aspect of conducting academic work regardless of discipline—not as a frame for collaboration but rather as an outcome. In the following section we further explore the role research questions might play within collaboration.

New questions for collaboration

As noted above, within the AFN team's collaboration the research questions came later rather than being the overarching framing for their project. This was echoed by an engineering professor in her collaboration with the OCLC team:

> I think just actually being able to do something together, like breaking ground on the project and getting the designs going, just the act of doing instead of talking about doing something, I guess was good. And, you know, that led to more research questions.

It is important to emphasise that during the OCLC team's experience with collaboration, there was not really a specific moment where conceptualising research questions around the irrigation system occurred. Instead, the designing was happening nearly simultaneously while they were digging the lines where the irrigation pipes would be buried. When one of us visited the urban farm, OCLC's Executive Director mentioned that the lines they were digging followed the experience of local farmers. The OCLC team essentially asked the farmers where the best place to put an irrigation line would be, then they would take measure-

ments and each time they would confirm from an engineering perspective that the farmers were right. By March 2022, they could see the results with farmers getting better access to water. But new questions arose about water retention and changes to soil quality. Thus, while the OCLC team, more than any other team, was initially wholly focused upon 'doing things' and were constructing the irrigation system while designing it (in the spirit of the "building an airplane while flying" metaphor), the end of the collaboration centred upon new questions that only became significant through the process of implementing their project.

However, collaborators' experience with 'conceptualising research questions' was not necessarily something that was limited to just wrapping up their project. Within the AFN team, 'conceptualising research questions' was often an opportunity for collaborators to reflect on the positionality of academia in relationship to the community. For instance, when we asked AFN's Executive Director how collaboration might change the way research questions are conceptualised, she said:

> I think the value of a community-based organisation is that we have the connections and we're doing the work in real time outside of the classroom and research lab….I think your questions totally change when you meet someone who's experiencing the problem you're studying…So there's that bridge building that I think is essential to answer the questions that are there…and connecting to that lived experience reforms the questions that would be asked.

As a community group leader, she sees herself as a bridge between the community and the science that is conducted in the collaboration. The process of collaboration therefore forces a re-conceptualisation of research questions as the academics build relationships with the community through the community group. The Executive Director mentioned to us that a severe challenge is that both academics and government officials who were concerned about the impact of heatwaves on the vulnerable communities of Phoenix had probably never visited one of the faith-based cooling centres. Without this hands-on experience, any scientific data these academics collect or analyse might not be relevant to the community that would benefit the most from such research.

The experience of collaboration for the Trees Matter team led them towards a slightly different perspective, which problematises a typical assumption that 'conceptualising research questions' tends to be for the purpose of expanding our limits of theoretical knowledge. For instance, when we asked the project manager for Trees Matter about how collaboration can change the conceptualisation of research questions, she replied:

> I think it takes the research questions outside of the realm of the theoretical and into the practical. So, instead of asking things like "how much carbon does the whole urban forest of Phoenix take out of the air?"…you could think "how much better is the air quality around the school if we plant five trees?"

For her, the latter type of research question is more specific and tailored to the needs of the community, an essential aspect of the field of community group work. Her point, however, is that collaboration provides us with the space to conceptualise a research question that is more practical and beneficial to the community. And when we asked the Professor of Practice with expertise in citizen science from ASU that same question, she gave a similar response:

> From the university's standpoint, too often we see the community group not as a collaborator, but as a way to broaden our outreach and impact… that has been extremely damaging to the trust with community groups and different populations in terms of them being willing to work with universities in that role. Usually, I don't see that coming the other way, where the community group is reaching out to a university. So, if there were ways to standardise and normalise this period of time for trust building negotiations, just working out mutually beneficial research questions, and that the time was funded for people to actually prioritise and think through it…I think that could be a game changer in terms of how we conceptualise research questions.

This is an important formulation of how 'conceptualising research questions' could work in col-

laborations, a formulation that reflects on how the field of academia has historically engaged poorly with communities. However, here the Professor of Practice has returned the discussion back to the facilitators of collaboration. She is noting that if the money is there to support the time it takes to build trust within collaborations, then it might be possible to conceptualise research questions that are mutually beneficial to both academics and community groups. Within such a framing, collaboration with a community group is no longer just about disseminating science from academia to a community, rather it is about 'doing things' by conceptualising research questions in a way that adds practical value to issues the community wants to address.

Exploring the distinction between 'doing things' and 'conceptualising research questions' across the Project Confluence teams helps clarify that this distinction is not necessarily connected with the cycle of deductive-inductive approaches to science. There could be confusion for the reader that the way we are describing 'doing things' simply refers to an inductive approach to science, where new research questions are conceptualised after data collection and analysis. While that did occur within the OCLC team, that is not what we are documenting through our study of the collaborations in Project Confluence. Rather we are demonstrating that 'doing things' is more akin to common sense, situated knowledge, or perhaps mêtis (Geertz, 1975; Haraway, 1988; Scott, 1998), all of which involve the concrete accumulation of knowledge through practice and experience allowing people to address a diverse range of challenges. These forms of knowledge are typically contrasted with the rote knowledge associated with Aristole's concepts of episteme and techne, the "theoretical know why and… technical know-how" (Flyvbjerg, 2001: 56) respectively. It is often assumed that scientists approach issues of episteme and techne by first conceptualising a research question. However, after reviewing the experiences of the teams within Project Confluence, it is worth questioning how these distinctions between rote knowledge and situated knowledge can be reconfigured within environmental justice collaborations.

Discussion: Conceptualising doing things

> The framing is almost always: Well you're either doing it as a passion project or you're doing it because somebody is already funding it with an external grant. …You know why? It's an odd thing but compensation for the ideation and the negotiations of the social dynamics, the trust building is hard…There's a lot of hard work put into it, then you write a proposal together and you're compensated later…We are always constantly chasing after proposals that don't think through these aspects of it first.

This was the response the Professor of Practice with expertise in citizen science from ASU gave when we asked her how the work done by the community group is valued within collaborations. It is an ideal quote for tying the pieces we have discussed in this paper together. As we have noted, an interest in 'doing things' was a motivator within Project Confluence, but it wasn't always an obvious one. Money was also necessary as a facilitator so that the groups could be compensated for the ideation process that would lead to 'doing things'. Moreover, it is during that ideation process that a change in understanding occurred allowing the team to come to a shared understanding that collaboration is about 'doing things'. In general, this process would be done volunteer or *pro bono*. The team is dependent on applying for a grant that might recoup their costs, often from a scientific foundation or government agency that still operates on the assumption that science is about 'conceptualising research questions' rather than 'doing things'. This also means that the structure of such grants provides tenured and tenure-track academics as well as university research staff with an advantage: their labour in creating a proposal is offset and guaranteed through the university. Thus, it may be necessary for funding agencies to consider alternative opportunities that support community groups and ensures a shared understanding can develop within collaborations during the earliest phases of the project.

The issues affecting collaboration that we discovered during Project Confluence go beyond the potential limitations of money as

a facilitator of collaboration because they also reflect on the structural differences that exist between community groups and academics. For instance, the purpose of the community groups we recruited to Project Confluence is to provide services to their communities. This is primarily done through the implementation of projects, which can of course be informed by science. For community groups trying to address environmental justice there is also often a sense of urgency that was described by the Professor of Practice with expertise in citizen science at ASU and the Executive Director of AFN. This explains why there is a strong emphasis on 'doing things' among the community groups in Project Confluence. In contrast, academics are trained to engage in planning and frame their science through theory. Typically, they also desire to gather together a holistic understanding through their work, which is why academics are more inclined to focus on 'conceptualising research questions', but all of this can take time.

An important argument can be made regarding the need for conceptualisation and the role that academics can and should play in addressing environmental justice through collaboration. The urgency that community groups face means that their project-based approach requires a hyperlocal focus. While this is what is needed to support the vulnerable communities these organisations represent, it simultaneously can prevent them from being able to address the systemic inequities at the heart of environmental justice. This is where academics can play a role. When academics are provided the space for conceptualisation, they can innovate in ways that ensure long-term solutions can be found to resolve the social inequities at the heart of environmental injustice. Moreover, this conceptualisation does not need to take place in a vacuum. As the project manager at Trees Matter noted above, collaborations provide academics the ability to engage not just with community groups, but also directly with the community. All of the academic collaborators in Project Confluence were motivated to make engagement with the community a central part of their labour, demonstrating that today there is a significant recognition that academics can—and should—act in the public interest (O'Brien, 1993). Thus, through collaboration, academics can use their skills in theorisation and conceptualisation in a way that ensures the outcome of their scientific approach is beneficial for the vulnerable members of the community most affected by issues of environmental injustice.

One of the reasons collaborations struggle to frame this kind of research and require time to reach a point where there is a shared understanding of collaboration among everyone within a team is because we do not have the language we need to structure these discussions. We need a name for the way the experience of collaborations merges what academics and community groups do best. We offer up 'conceptualising doing things'. We discovered that even when we asked our interlocutors about how collaboration might change the way they ask research questions they pointed out that such questions would become more practical and grounded to the community. Thus, our use of 'doing things' is a summation of statements from Project Confluence collaborators, like "getting things done" and "building an airplane while flying", that carries an implicit prepositional phrase: 'doing things [for the community]'. This implicit understanding is essential for framing 'conceptualising doing things' and for distinguishing it from other approaches of applied science and STS interventions (Zuiderent-Jerak and Jensen, 2007; Bickman and Rog, 2009). In this sense it has a closer affinity with the way STS scholars have explored 'making and doing' (Downey and Zuiderent-Jerak, 2016) and encompasses the kind of 'research altruism' (Carrera et al. 2018) that we found motivated individuals in Project Confluence. There are also examples of 'conceptualising doing things' in case studies from classroom settings, such as when students are taught to use DIY sensors to demonstrate the impacts of environmental injustice in the local community near their university (Kenny et al., 2019).

'Conceptualising doing things' operates on a continuum rather than an absolute. This is obvious from the three collaborations we have outlined here. The OCLC team was able to focus entirely on project implementation during their collaboration and only began to theorise towards the end of the project. The AFN team had an urgent need to

Table 2. Matrix of 'conceptualising doing things' and the results of Project Confluence

		Contribution of Academic Partners		
		Implementation	*Balanced*	*Theorisation*
Mission of Community Group Members	*Implementation*	OCLC Team	AFN Team	
	Balanced		Trees Matter Team	
	Theorisation			

establish a new community group for managing cooling centres, but also wanted to analyse interviews to sketch out what that new organisation might look like. The Trees Matter team in contrast saw this as an opportunity to refine an idea they had for designing a digital platform that would encourage people to share their experiences with trees in their neighbourhood. Thus, there is a mixture of implementation and theorising that can emerge from 'conceptualising doing things' and a collaboration can place more or less emphasis on either. It is also true that some academics may feel more comfortable with implementation or theorising than others; and the same could be true for those working in community groups. With this in mind, the make-up of a team could potentially be balanced depending on whether the challenge that a community group intends to address requires more theory or more implementation. We could imagine a grid where the continuum of 'conceptualising doing things' intersects at the confluence of the strengths of academics and community groups (Table 2).

While none of the projects in Project Confluence began 'conceptualising doing things' with research questions, we can imagine collaborations that require greater degrees of theorisation and could be organised by tweaking the model of knowledge creation to move an academic field forward and converting it into knowledge creation to address an important social issue. Thus, future research can attempt to fill out an understanding of how diverse collaborations operate across the *matrix of 'conceptualising doing things'*. For STS researchers, this would be an important step in interpreting a field of collaboration for addressing issues of environmental injustice (Boucher et al., 2020) because it would allow us to better understand how forms of social, economic and intellectual capital can be brought to bear on different types of collaborations.

Conclusion

The open-ended and qualitative approach of Project Confluence led us to discover that collaboration can be about 'conceptualising doing things', providing us with a matrix of possibilities for collaborations to consider along a spectrum of implementation and theorisation. Moreover, we found that research questions could still emerge and become important at different stages of a collaboration. The process of 'doing things' opened up space to conceptualise new questions that had yet to be asked within the collaborations. Thus, collaboration can challenge our assumptions of how science operates when our research is focused on issues that need addressing *now*.

Much as Hess (2013) understood that sociological field theory is the proper theory for exploring the relationship between neoliberalism and science, so too is it the appropriate frame for understanding the relationship between environmental justice and science. The political ideology that informs environmental justice provides the academic field with the kinds of capital it needs to support pluralist working styles that "seeks diversity and inclusion and a celebration of different perspectives" (Halfon and Sovacool, 2022: 20). At the same time, a field sociology approach helps ensure that we do not fall into the same problems that faced the short-lived interests-based concern that social structure can explain everything. As we have tried to show, the meaning being the 'currency of collaboration' also plays an important role in guiding the accumulation of social capital for our informants. We also need to recognise that the goal of collaborations is quite different than the concern for credit that was at the heart of Mertonian functionalism (Merton, 1973) and Marxian interests scholars (MacKenzie, 1978). Within the field of community science the focus is upon using science to improve the welfare of the people living within the collab-

orators' communities. Thus, again, field theory helps us make the theoretical connections to the extra field of community that is so intimately tied to the way science is understood and practiced by our informants.

While in theory the scientific method is perceived by scientists to have a particular structure and order, in practice this process is messy. This messiness has almost become a truism within STS that leads some scholars to be unapologetic for the way their interpretations might enable an anti-science discourse, such as around climate change (e.g. Fuller, 2017). However, one point that is often lost amidst claims about how science operates is that when engaging in collaboration, the experience of either the supposed structure or messiness of science becomes mere background noise. The act of collaboration, either implementing a project or conceptualising a new research question, can bring meaning both to one's own life and a shared meaning across one's team. For collaborators, there is also the foregrounding of trying to reach a shared understanding through which a change in understanding can occur, while the concerns with the messiness and structure of science fall away from their focus. Some have even called this process and experience of reaching a shared understanding through debate fun (Graeber, 2014). Julia Wondolleck and Steven Yaffee's seminal work on collaboration in fact argues that while the teams they studied were undoubtedly working hard to address issues of natural resource degradation, the successful projects "were having fun at the same time" (Wondolleck and Yaffee, 2000: 168).

Of course, collaboration is also serious; everyone in Project Confluence was, after all, discussing how to address environmental injustice. Addressing environmental injustice through collaboration produces a specific form of "shared experience of a danger made real" that encourages us to "develop language and claims and demands and stories that represent our particular fate, in order to narrate that experience of being an instance of a particular collectivity of suffering" (Kelty, 2019: 84). In that sense, community science for addressing environmental injustice should not only be described in terms of its structure or its messiness. Rather collaboration can be about experiencing serious fun while labouring together in a way that will bring benefit to the community as collaborators surpass their individual understandings of science and form a collective dedicated to addressing a shared experience of suffering.

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Notes

1 To protect our informant's privacy, we have anonymised the names of individuals within the collaborations discussed in this article.

2 Although engineering and other technical work had an important place within these collaborations, for clarity we will collectively refer to all work as 'scientific' work, and aggregate both of these activities into discussions of 'science' throughout the article.

3 For the initial interviews, for the Arizona Faith Network team, we interviewed one community group leader and four academics; for the Trees Matter team, we interviewed two community group leaders and three academics; for the OCLC team, we interviewed one community group leader and three academics; and for the Indigenous Vision team, we interviewed two community group leaders and four academics. Note again that three academics were on two teams, and thus, the total number of initial interviews was 17.

4 For the follow-up interviews, for the Arizona Faith Network team, we interviewed one community group leader and three academics; for the Trees Matter team, we interviewed two community group leaders and two academics; and for the OCLC team, we interviewed one community group leader and three academics. The Indigenous Vision team disbanded, and one of the academics that was on two teams had to stop participating because of a job change.

5 When the Project Confluence research project was started, this participant was employed at ASU. Part-way through the project, they moved to the University of California-Merced.

6 In colloquial American English, "pulling the trigger" means to start taking action to do something.

Appendix A: Project Confluence | Final Teams

Team and challenge identified	Team member	Expertise	Previous collaboration experience
Arizona Faith Network: Design a coalition to coordinate faith-based cooling centres in response to the extreme heat events	Executive Manager, Arizona Faith Network	interfaith dialogue and theology, facilitation, conflict resolution, organizational design, non-profit management	No previous collaborative experience with scientists or engineers
	Assistant Research Professor, Sustainability, ASU	adaptation, equity, vulnerability, urban policy, and governance for the mitigation and adaptation to extreme heat and urban heat island effects	Collaborated with community groups and local government to address urban heat issues
	Assistant Professor, Department of Civil and Environmental Engineering, UC-Merced*	sustainability and resilience of urban and infrastructure systems, climate change mitigation and adaptation, social-ecological-technological systems; risk analysis under uncertainty	No previous collaborative experience with community groups
	Graduate student, ASU	Public policy, psychology, community support for vulnerable and homeless populations	Collaborated with community groups to address heat and homelessness
	Asst. Director, University Sustainability Practices, ASU	sustainability program design, operations, and management	Worked in an environmental justice advocacy community group
Trees Matter: Create a digital platform through which the general public can interact with their local canopy.	Executive Director, Trees Matter	geography, environmental policy, certified arborist	Is a professional arborist working in a community group
	Program Manager, Trees Matter	sustainability, community organization	Collaborated once with geospatial scientists, regular collaboration with arborists
	Librarian, ASU	citizen science, government information	Regular collaboration with community groups through digital citizen science platform
	Asst. Director, University Sustainability Practices, ASU	sustainability program design, operations, and management	Worked in an environmental justice advocacy community group
	Professor of Practice, College of Global Futures, ASU	citizen science and participation	Regular collaboration with community groups through digital citizen science platform
Orchard Community Learning Center: Develop an efficient irrigation system design for improved water resources management at the Spaces of Opportunity community farm and incubator.	Executive Director, OCLC	farm-to-table food, STEAM education, elementary and bilingual education	Regular collaboration with scientists on the board of OCLC and Spaces of Opportunity
	Assistant Professor, Sustainable Engineering, Ira A. Fulton Schools of Engineering, ASU	watershed modeling, surface hydrology, water quality, agricultural ecosystems, evaluating impact of land management decisions within the food-energy-water nexus	Engagement with rural stakeholders and community groups representing rural stakeholders
	Undergraduate student	environmental engineering	No previous collaborative experience with community groups
	Undergraduate student	environmental engineering	No previous collaborative experience with community groups
Indigenous Vision: Building a map and database of pollution/land degradation on Indigenous land in North America	Senior leader, Indigenous Vision	water quality, mining contamination clean-up, and water-treatment	Is an environmental scientist working in a community group
	Senior leader, Indigenous Vision	American Indian studies, geography, facilitation, cultural humility	Collaborates regularly with geospatial scientists
	Assistant Professor, College of Global Futures, ASU	environmental justice, science and society, energy policy	Direct engagement with community groups and tribal representatives during research
	Director for Data Science and Analytics, ASU	data science and visualization, human-technology network analysis, collaborations that bridge environmental sciences and humanities.	Once collaborated with a community group to organize a display of a local writer's papers
	Professor of Practice, College of Global Futures, ASU	citizen science and participation	Regular collaboration with community groups through digital citizen science platform
	Assistant Professor, Department of Civil and Environmental Engineering, UC-Merced*	sustainability and resilience of urban and infrastructure systems, climate change mitigation and adaptation, social-ecological-technological systems; risk analysis under uncertainty	No previous collaborative experience with community groups