



Facilitating Spaces of Urban Agroecology: A Learning Framework for Community-University Partnerships

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At the local scale in Minneapolis/St. Paul (MSP), MN, urban farms, community gardens, and home gardens support diverse individual and community goals, including food access and sovereignty, recreation and outdoor activity, youth education, and racial, economic, and environmental justice. Collaborations between urban growers, policymakers, scholars, and communities that leverage urban farms and gardens as sites of ecological, social, and political transformation represent spaces of urban agroecology. Participatory research can play a vital role in urban agroecology by facilitating integration of science, movement, and practice, but frameworks to accomplish this are still emerging. This paper, therefore, proposes a “learning framework” for urban agroecology research that has emerged from our community-university partnership. We—a group of growers, community partners, and researchers—have worked with each other for 5 years through multiple projects that broadly focused on the socio-ecological drivers and impacts of urban farms and gardens in MSP. In fall 2019, we conducted our first formal evaluation of the participatory processes implemented in our current project with the objectives to (1) identify processes that facilitated or were barriers to authentic collaboration and (2) understand the role of relationships in the participatory processes. Qualitative surveys and interviews were developed and conducted with researchers, partners, and students. Analysis revealed that urban agroecology research provided a space for shared learning, which was facilitated through co-creation of research, embodied processes, and relationships with people, cohorts, and place. As part of our partnership agreements, we as researchers wrote this article—in close consultation with partners—to share this framework in the hopes that it will serve as a model for other research collaborations working within complex urban agroecological systems.

Keywords: urban agriculture, participatory research, sustainable agriculture, community gardens, urban farms, food justice, community-engaged learning

INTRODUCTION

Urban growers, organizers, and policy makers in Minneapolis/St. Paul (MSP), MN, view urban food growing initiatives as an important strategy to support diverse goals such as food access, intergenerational learning, racial/environmental justice, climate adaptation and mitigation, stormwater management, community development, and food justice (Recknagel et al., 2016). These goals are pursued through farms, community gardens, and home gardens that utilize diverse growing practices such as raised beds, containers, high tunnels, aquaponics, integration of perennials, and other diversified farming practices (Recknagel et al., 2016). The number of farms and gardens in MSP has increased steadily over the past decade, from 166 community gardens in 2009 to over 600 in 2016 (Prather, 2016).

These increases are the result of significant grower, policymaker, neighborhood, researcher, school, and community efforts to improve support and funding for urban farms and gardens at the city, county, and state levels (Lang, 2014; Recknagel et al., 2016; Department of Community Planning Economic Development, 2018; Bress, 2019). As these diverse advocacy efforts and their documentation suggest, urban growing initiatives arose from collaborations between growers, supporters, and scholars. Collaborations imagine and enact new ways of being in relationship with individuals, communities, and the environment through urban food production, thus joining global movements for food sovereignty and justice (Penniman, 2018). We—a group of growers, community partners, and researchers—have collaborated with each other for 5 years on a multi-site program of participatory urban agroecological field research, and this article reports on a mid-process evaluation of our participatory processes. *This article specifically addresses the need for learning frameworks that help such collaborations adaptively share knowledge, cultivate relationships, and engage in collective action toward systemic transformation.*

Urban Agriculture and Urban Agroecology

The “radical, transformative potential of urban food production spaces” is not adequately addressed within the current urban agriculture paradigm (Siegner et al., 2020). Definitions of urban agriculture often focus on yield and productivity, perpetuating productivism, which prioritizes maximizing yield over other potential benefits or externalities. Consequently, this focus on productivity limits our imagination for the wide variety of co-benefits provided by urban farms and gardens (Siegner et al., 2020). A focus on yield alone arises from reductionist/positivist research paradigms, which form the foundation of many natural (and social) science disciplines (WinklerPrins, 2017; Bowness et al., 2021). Reductionism seeks to break down systems into discrete, ever smaller component parts, and positivism is grounded in the idea that “solving” these component parts will “solve” the systemic problems. Framed by calls to feed the world’s growing population, these paradigms result in a focus on maximizing yield as the solution to hunger, which fundamentally doesn’t address how inequitable food access (among other challenges) are the result of historic and contemporary systems of oppression (Cadieux and Slocum, 2015). In urban areas specifically, such systems include racist planning policies such

as limited land access/tenure, financial barriers, pollution and soil contamination, development pressure, and gentrification (Greenberg-Bell, 2019). Thus, a productivist definition of urban agriculture fails to *locate challenges within the systems that create them* and instead attributes problems to *individuals and neighborhoods*.

Research, which is itself embedded in social and political relationships, is not alone in perpetuating such narratives; as Pudup (2008) wrote, non-profit and local governments often:

deliberately organize gardens to achieve a desired transformation of individuals in place of collective resistance and/or mobilization.... Linking all such efforts is the promise that direct contact with nature, through gardening, will transform people who are otherwise poor and socially and culturally marginalized.... In other words, gardening is a personal and not a social process in contemporary garden projects (1230).

In other words, research and action paradigms that rely on metrics like yield per acre, vegetables per neighborhood, or production potential reproduce the idea of individual responsibility to solve systemic challenges—which is an especially dangerous narrative when working with communities experiencing marginalization due to race, class, immigration status, sexuality, etc. Thus, we echo Siegner et al. (2020) in arguing that this productivist focus on yield and individuality fundamentally obscures the complex (and usually more-than-monetary) socio-ecological goals, practices, and impacts of urban food production.

Urban agroecology represents an alternative research and action paradigm that “clearly positions itself in ecological, social, and political terms” (Tornaghi and Hoekstra, 2017). As opposed to reductionism, urban agroecology encompasses complex systems and relationships to explore questions of governance, resource availability, education, ecological relationships, policy, and justice; this breadth provides space to explore the diverse outcomes and goals of urban food production (Fernandez et al., 2015). Through this systemic approach (Meadows, 2008), urban agroecology builds on broader agroecological traditions, which seek to “transform food and agriculture systems, addressing the root causes of problems” (FAO, 2018).

While there are many definitions of agroecology, the label is used to encapsulate efforts that focus on *ecological* relationships, sustainable farming *practices*, and food sovereignty, land access, and other socio-political *movements* (Holt-Giménez, 2011; Rosset and Martínez-Torres, 2012; Levkoe et al., 2019). Wezel et al. (2009) proposed that these threads of agroecology were grounded in different traditions, while more recent scholarship has focused on the potential power to transform agrifood systems when they are interwoven (Montenegro de Wit, 2014; Fernandez et al., 2015; FAO, 2018). Despite the potential, however, agroecological science often struggles to integrate with movement and practice, in part because balancing the expectations of broader scientific rigor, reductionism, and knowledge creation runs counter to the expectations for dispersed power, socio-political engagement, and systemic focus of movements and practice (Montenegro de Wit and Iles, 2016).

Enacting Urban Agroecology Through Participatory Research

Participatory research approaches are often positioned as important strategies to integrate agroecological science with movements and practitioner knowledge (e.g., Stassart et al., 2005; Montenegro de Wit, 2014; FAO, 2018). In contrast to positivist scientific research in which scholars drive research, participatory action research (PAR) requires shared power/ownership so growers and communities can meaningfully participate throughout the research process, including generating questions, designing and implementing methods, analyzing and creating meaning from data, and sharing results (Méndez et al., 2017). The goal of shared ownership is both to ensure that all partners benefit from the research and that knowledge is shared across institutional and cultural boundaries (FAO, 2018). PAR relies on iterative cycles of reflection, research, and action to ensure that shared ownership and benefits remain relevant to participating growers, scholars, and communities (Méndez et al., 2017). Méndez et al. (2015) argue PAR is necessary to “include or amplify those voices that have been traditionally excluded from the research process.” Finally, it is necessary to acknowledge that this complex, negotiated process takes time and commitment to nurture long-term collaborative relationships grounded in humility, trust, and accountability (Méndez et al., 2017). Taken together, PAR in agroecology reimagines *who* generates knowledge, *how* it is generated, and, ultimately, *what* is considered knowledge (Montenegro de Wit and Iles, 2016; Méndez et al., 2017).

Thus, participatory approaches developed in rural agroecology provide a valuable foundation for urban agroecology. Multiple partnerships and sites are now refining these approaches for urban agroecology; researchers in the Bay Area (Montenegro de Wit, 2014; Altieri and Nicholls, 2018) and Central Coast (Egerer et al., 2018) of California, Portland (McClintock et al., 2016), and Chicago (Taylor and Lovell, 2015) are just a few examples. This dispersed network across many cities and regions means that it is vital to share and report back as we build participatory approaches for urban agroecology (and contribute, more broadly, to community engaged scholarship).

Over the past 5 years, we—a group of researchers, growers, community organizers, and students in MSP—have also implemented participatory practices for urban agroecology research. MSP provides a particularly salient case right now for contemporary researchers in this field, with intense scrutiny of racial equity, differential resource access and outcomes in health and wealth, and unusually broad public discussions of the relevance of urban food production for meeting community economic development and other needs, from hyper-local to state scales. In addition to PAR, we’ve drawn inspiration from a strong local infrastructure for community-based participatory research (CBPR), such as long-term public health collaborations (Gust and Jordan, 2010; Jordan and Gust, 2010; SoLaHmo Partnership for Health and Wellness and University of Minnesota Program in Health Disparities Research Advisory Board, 2017), the University of Minnesota Center for Urban and Regional Affairs research model (Anderson, n.d), and food

systems collaborations (Miller, 2012; Goellner, 2013; Ramer et al., 2016; Charles, 2018).

While PAR and CBPR are similar, these CBPR programs have a stronger focus on racial equity, reparative practice, and linking research outcomes with organizing for change. Most models also explicitly call for research that builds on community strengths (Israel et al., 2008; SoLaHmo Partnership for Health and Wellness and University of Minnesota Program in Health Disparities Research Advisory Board, 2017), which reflects calls in MSP for research that is grounded in community assets (McKnight Foundation, 2011). More recently, community organizing literature has articulated this call as working from a lens of abundance—the idea that we, together (growers, organizers, researchers, policymakers, artists, and others), already have the necessary skills and resources to actualize transformative visions (brown, 2017). Participatory research frameworks that integrate agroecological science, participatory process, reparative practice, and collective action are still being developed. Thus, through our participatory urban agroecology research program, we seek to create such a framework. PAR in rural and urban agroecology, CBPR, and our mentors in community organizing have shaped the overall goals of our community-university partnership to (1) integrate grower knowledge and experiences throughout the research process and (2) deepen relationships between community and university partners in order to support community-led transformation of urban food systems.

It is necessary, however, to create space to evaluate whether the *intentions* of our goals align with *implementation* and *impact*. As Arnold and Siegner (2021) write, idealizing “community-academia relationships creates an environment where UAE [urban agroecology] researchers can fail to assess processes and outcomes, creating space for negative externalities in the form of extracted knowledge and labor from at-risk communities.” Thus, in Fall 2019, we undertook a participatory evaluation process to identify strengths and opportunities for improvement in our program. Our objectives were to:

- determine to what degree participatory research processes facilitated authentic collaboration between researchers and community partners, and
- understand the role of relationships between researchers, partners, and students in those processes and how relationships were formed.

The results of qualitative surveys and interviews conducted with researchers, community partners, and students illuminated that a unique role of urban agroecology research programs is to facilitate shared learning, which is seen as a key part of collective, transformative action. In other words, the broader purpose of principles like iteration, shared power, mutual benefits, and relationships were to support learning communities, which requires a framework beyond participatory principles alone. We use the themes identified in our responses to propose a “learning framework” for community-university partnerships to facilitate spaces of urban agroecology, which we hope will be a valuable tool for other researchers and communities.

URBAN AGROECOLOGY RESEARCH IN MINNEAPOLIS/ST. PAUL

In Fall 2019, we conducted this evaluation of our community-university research participatory processes at the midpoint of a broader program exploring how management practices used in urban farms and gardens impact a holistic set of ecosystem services, including food production, water quality, soil health, biodiversity, and socio-cultural benefits (Nicklay et al., 2019). We trace the origins of our partnership to 2015, when two projects—one researcher-initiated, the other community-initiated—converged to explore the co-benefits of urban food production. In this section, we provide an overview of how participatory processes evolved in our partnerships.

The researcher-initiated project (**Figure 1**) grew out of a food systems summit sponsored by the University of Minnesota, where Mary Rogers (a co-author of this paper) proposed that an ecosystem service framework could make the social, cultural, and environmental impacts of urban food production legible for a wide variety of stakeholders (Camps-Calvet et al., 2016). Project activities focused both on building relationships and exploring how growers, community organizers, researchers, extension educators, and policymakers conceptualized the multiple benefits and challenges of urban food production. This project largely focused on “pre-flection” —conversations with communities before research starts (Méndez et al., 2017). However, many of the engagement activities, such as a public art installation where residents could bring soil for lead testing, also represented concrete actions to address community-identified needs.

At the same time, a local farm advocacy non-profit approached Nic Jelinski and the Jelinski lab researcher Kat LaBine (both co-authors of this paper) to conduct a pilot study investigating urban food production as a potential green infrastructure strategy; this research need was identified by the non-profit through listening sessions with over 50 growers. The non-profit mediated all communications between the researchers and growers, which helped initiate connections to establish on-farm field plots. However, this also placed a large labor burden on that non-profit, limited relationship building between researchers and growers, and resulted in misunderstandings regarding data collection requirements and logistics as the season progressed. While collaborators identified these communication concerns, growers still felt the study activities fulfilled their research needs.

Though initiated separately, the researcher- and community-initiated projects involved many of the same practitioners, organizations, and researchers (**Figure 1**), who together marked the end of both projects by hosting the Twin Cities Urban Agriculture Research Workshop in October 2016. About 70 growers, organizers, policy makers, and researchers attended the workshop to share knowledge and facilitate reflection on the projects' activities through presentations, breakout sessions, and networking time (Frank et al., 2017). There was a great deal of energy around the pilot study results from the community-initiated project, so five researchers and three community partners decided to continue the community-university partnership. New partners, who connected with the project through

engagement activities, also joined; for example, Jennifer (the lead author of this paper) attended the Workshop as a community garden coordinator and later joined as a graduate student researcher.

Together, this group designed a 3 year, on-farm project to explore how urban food production practices impact a holistic set of ecosystem services; the group also helped inform a 5 year off-farm study led by Gaston “Chip” Small (a co-author on this paper), which had more space and time to explore additional management practices. The goals of these projects were to integrate grower knowledge with on- and off-farm research to create tools/guidance for growers implementing management practices and policy resources for local non-profits and governments. During this moment of transition and project design, researchers and partners also reflected on the 2016 projects and identified necessary changes to participatory processes.

To create a structure that supported shared power, we shifted from what Quick and Feldman (2011) describe as high participation to high inclusion. While the engagement activities in the researcher-initiated project created space for *a large number of participants*, the smaller group in the community-initiated project facilitated *greater inclusion of partners* in the decision-making process. Importantly, researchers and partners remain accountable to the large network of organizations and practitioners who shaped this work because we often check-in with those wider networks at meetings, events, and through personal communication.

This structural shift was paired with new internal communication processes, including a yearly “All Hands” meeting for all project researchers and partners to participate in planning, methods design, and analysis. This structure would also provide ongoing space to identify and integrate relevant benefits for all partners. To create a strong foundation for mutual benefits, financial compensation for community partners was increased and researchers committed to hiring undergraduate research assistants to train in community-engaged scholarship—and plan for about ¼ of undergraduate time to support partner operations via contributed labor.

To facilitate stronger relationships, we built on strategies developed in the researcher-led project, where direct communication between researchers and growers, conversation groups, and participation in community events had created strong relationships. Though participants acknowledged the logistical benefit of a communication mediator (such as the non-profit in the community-initiated project), it precluded the relationship building necessary to build trust between participants in different roles.

These processes have guided our work over the last 3 years, but continual reflection and evaluation are necessary to ensure that processes are effective, relevant, and inclusive. Thus, in Fall 2019, we undertook a participatory evaluation to determine how these processes had facilitated or impeded genuine collaboration in our community-university urban agroecology partnership. The goal of this evaluation was to identify strengths and opportunities for growth that could be built on during the 2020 field season and used as a foundation for future projects.

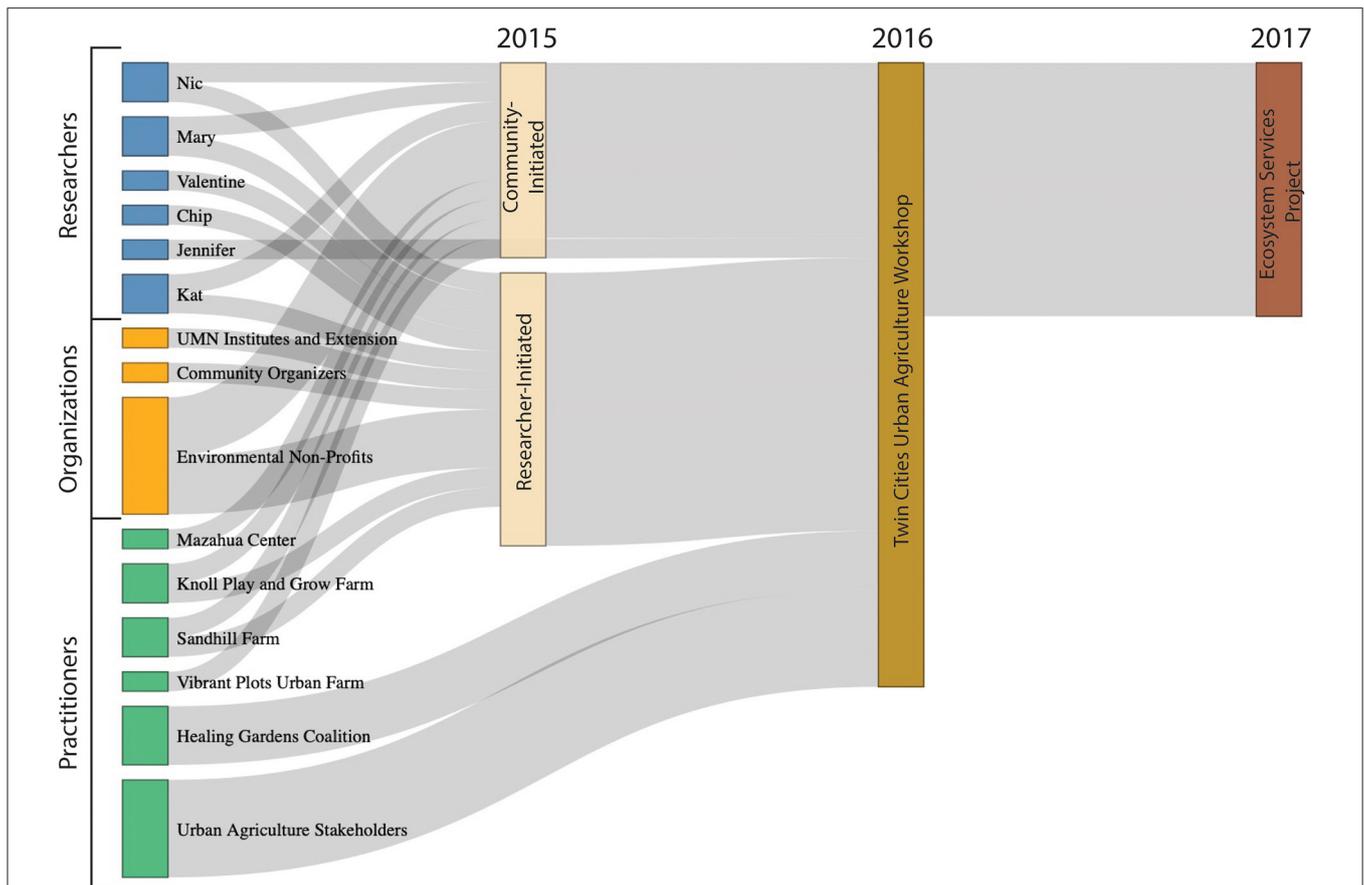


FIGURE 1 | MSP Urban Agroecology Community-University Partnership Development. The progression of our research program from the initial conversations and pilot studies in 2015 to the start of the current projects in 2017. At the University of Minnesota Convergence Colloquium on Sustainable Foods in 2015, a group of 20 researchers, organizers, and practitioners connected and pursued a 1 year, researcher-initiated project to host conversations and engagement activities around the ecosystem services of urban farms and gardens. At the same time, a community-initiated project convened three researchers, several non-profits, and four growers to do an on-farm pilot study exploring the potential for urban food production as a green infrastructure strategy. The projects converged by collaboratively hosting the Urban Agriculture Research Workshop, which was attended by over 70 urban growers, organizers, policymakers, and researchers. Some attending this workshop would eventually join the ecosystem services project. After the workshop, some partners from the community- and researcher-initiated projects left to pursue other priorities or other participatory projects, and a smaller group continued working together for the current ecosystem services research.

METHODS

At the end of 2019, we developed and administered an open-ended survey to evaluate our participatory processes, understand relationships within those processes, and articulate the community-university research framework emerging from this work. Researchers led question development, drawing on evaluation examples from prior participatory and community engagement scholarship, both locally (Gust and Jordan, 2006; Union of Concerned Scientists, 2015; Frank et al., 2017; Livstrom et al., 2018) and nationally (Pain et al., 2011). All partners and students were invited to review/edit the draft questions and create additional ones if an important area was overlooked. Ultimately, fifteen question surveys were developed for researchers, community partners, and students (Table 1). Respondents were asked to choose their main role, though many hold multiple roles in the wider urban agroecology network. Ten questions were the same across all roles; these questions explored relationship building,

learning, and the benefits/challenges of community-university partnerships. The remaining five questions were role-specific, focusing on how individuals in different roles experienced shared power and mutual benefit processes. The survey was considered “exempt” by the Hamline University Institutional Review Board.

The survey was distributed to all current members of the urban agroecology community-university research program. Six researchers, seven community partners, and eight students completed the survey (Table 2)—a 91% response rate. The survey was administered online to researchers and students using Qualtricssm. Community partners could choose the survey delivery format: two individuals completed the survey online, two in one-on-one interviews, and three as a focus group. Interviews and the focus group were audio recorded for transcription. While multiple delivery methods can complicate analysis, providing community partners with the agency to choose how to conduct this evaluation was one way the researchers demonstrated respect for their time and experiences.

TABLE 1 | Evaluation Survey Questions.

Everyone

Describe our collaborative urban agriculture project in 2–3 sentences.

What are/were your goals for participating in this project?

What is/was your role in this collaborative project? *Community Partner, Researcher, Student*

Who are the other collaborators you interacted with most for this project?

This could include people who are researchers, students, and/or community members. If you've interacted a lot with more than one person, feel free to include multiple names!

What experiences, practices, or processes helped you build and maintain relationships with those collaborators?

Community partners	Researchers	Students
<p>What processes and/or products have been useful to you? <i>Some examples of processes could be emails, in-person conversations, yearly meetings, etc. Some examples of products could be nutrient test results, signing letters of support, or other actions</i></p>	<p>What is community-engaged research to you? Why is it important?</p>	<p>What is your major and current year in school?</p>
<p>Have researchers and/or students shown up with your community in meaningful ways? Yes/No</p> <p>If Yes: Please share what that looked or felt like when researcher and/or students showed up with your community</p> <p>If No: Please share your vision for how researchers and/or student could meaningfully show up with your community in the future</p>	<p>What are the benefits and challenges of community-engaged research?</p>	<p>When did you work with this collaborative project? Please include start and end dates (month/year), if applicable</p>
<p>How have you participated in decision making? <i>This could include things like helping with the original grant, deciding where to locate the plots, etc.</i></p>	<p>In what ways does your institution support this work? What could your institution do to better support your community-engaged work? <i>For example, consideration in P&T, capacity to use research funding for teaching releases, student support, administrative support, funds, recognition, etc.</i></p>	<p>Prior to working on this project, did you have experience with service learning or community-engaged work? Yes/No</p> <p>If Yes: Please briefly describe your prior service learning or community-engaged work experiences</p>
<p>What communication strategies have you found most valuable? Is there anything you wish could be done differently?</p>	<p>How does community-engaged research contribute to your scholarship, teaching, or service responsibilities?</p>	<p>How did your participation in the collaborative urban agriculture project shape your understanding of community-engaged research?</p>
<p>When have you felt heard/seen? When have you felt dismissed/uncomfortable?</p>	<p>How does community-engaged research contribute to your mental health, well-being, or sense of purpose?</p>	<p>How does community-engaged research contribute to your undergraduate experience?</p>

Everyone

What is the value of approaching urban agriculture research through community-engaged research, from your perspective?

In answering this question, some things to keep in mind are: what values are embedded, lived, and communicated in this collaboration? what are the benefits and challenges of partnering with academic institutions? what are the benefits and challenges of partnering with other growers/organizations?

How has your understanding of urban agriculture changed as a result of this collaborative project?

What other things have you discovered, learned, or experienced that you want to share?

We welcome any and all responses, and we are particularly interested in how urban agriculture and ecosystem functions can reinforce or address systems of power and privilege/racism/etc.

When we wrap this iteration of our collaborative work in Fall 2020, what are some things we should consider in the project evaluation and reflection?

Who are the individuals, organizations, or communities that should be invited into this work in the future?

Fifteen-question surveys were developed for partners, researchers, and students. Questions are listed in the same order they were presented to participants. Ten questions were the same across all roles (labeled as "everyone"). The remaining five questions were role-specific. Text in italics that follows questions is explanatory information that was provided to participants.

Inductive coding was used to analyze responses (Christians and Carey, 1989; Lofland et al., 2006). Codes and emergent themes were then compared to existing codebooks, field notes, and participant observations created by Valentine¹ based on

her long-term work in the Twin Cities (Cadieux et al., 2013); coding schemes were used to identify key community-university research framework components in the analysis phase. Survey results and the “learning framework” were shared with all research group members at the “All Hands” annual project meeting in early 2020, and their feedback was used to refine the framework and analysis. Researchers conducted evaluation analysis alongside and in communication with

¹While using titles and last names are conventional in most academic writing, we use first names throughout this paper to reflect how our group interacts with each other.

TABLE 2 | Fall 2019 Evaluation Respondents.

Names	Identities	Organization	Description
COMMUNITY PARTNERS			
Fannie*	Female, Black	Knoll Play and Grow Farm* St. Paul	Farmer. Knoll Farm is a non-profit farm located in neighborhoods with Hmong, East African, and Black communities. They focus on youth education and community building; produce is sold at markets and taken to the weekly neighborhood food shelf
Lily*	Female, White, community elder	Healing Gardens Coalition* St. Paul	Lily and Joshua are co-organizers of the Coalition, and Benny is the coordinator for a community garden in the Coalition. The Coalition has member gardens throughout a predominantly Black neighborhood. The Coalition sees connection with land as a way to heal intergenerational trauma and growing food as a way to heal physical health while building community wealth
Joshua*	Male, Black, community elder		
Benny*	Male, Black, community elder		
Pepe*	Male, White	Mazahua Center* Minneapolis	Pepe is the Food Systems Manager and Amanda is the Farmer. Mazahua is a non-profit located in one of the most diverse neighborhoods in Minnesota, with particularly large Indigenous and Central/South American immigrant communities. Their urban agriculture program focuses on food production, youth education, intergenerational learning/healing, and land access. Food supports their community food shelf and kitchen
Amanda*	Female, White		
Caitlin*	Female, White	Sandhill Farm* Minneapolis	Farmer. Sandhill Farm is a for-profit business that farms several vacant lots and former parking lots. They primarily sell at farmers markets and through a Community Supported Agriculture program
RESEARCHERS			
Jennifer Nicklay	Female, White, Queer	University of Minnesota	Non-faculty researcher: graduate student. Focus: agroecology, political ecology, and soil science
K. Valentine Cadieux	Female, White, Mixed ancestry	Hamline University	Faculty researcher. Focus: geography, political ecology, food systems, and sustainability
Mary Rogers	Female, White	University of Minnesota	Faculty researcher. Focus: entomology, plant science, and horticulture
Nic Jelinski	Male, White, Hispanic	University of Minnesota	Faculty researcher. Focus: soil science and urban systems
Kat LaBine	Female, White, Dakota	University of Minnesota	Non-faculty researcher: Jelinski Lab Manager. Focus: soil science
Chip Small	Male, White	University of St. Thomas	Faculty researcher. Focus: nutrient cycling and hydrology
UNDERGRADUATE STUDENTS			
Karl	Male, White, Cis/heterosexual	University of St. Thomas	May 2018–present. Biology major.
Matt	Male, White	University of Minnesota	May 2018–May 2019. Environmental Science, Policy, and Management major
Naomy	Female, Latina	University of Puerto Rico	June–August 2018. Sustainable Agriculture major
Tulsi	Female, Asian, Queer	Macalester College	June–August 2018. Knoll Farm Intern in 2019. Environmental Studies major, Food, Agriculture, and Society concentration
Dania	Female, Mexican-American	University of Minnesota	May–December 2019. Environmental Justice Studies and Landscape Design/Planning major
Madison	Female, White	University of St. Thomas	May–August 2019. Biology major
Tanner	Male, White, Queer	University of Minnesota	May 2019–March 2020. Former Sandhill Farm intern. Global Studies B.A. (2013), returning to complete requirements for plant science graduate program
Yashira	Female, Hispanic	University of Puerto Rico	June–August 2019. Sustainable agriculture major

At the request of respondents, individual/organization names have been changed for all community partners (marked with an asterisk); most partners chose their own pseudonyms. Student last names have also been omitted. Participant identities were chosen by each individual in relation to ongoing discussions and topics in the survey responses.

partners throughout the writing process, though partners chose not to be listed as authors.

All statistical and diagrammatic analyses were performed in R (version 3.5.2, R Core Team, 2018). The project development visualization (**Figure 1**) was constructed using the networkD3 package and network diagrams to visualize relationships (**Figure 5**) were constructed using the iGraph package.

RESULTS

The objectives of our Fall 2019 participatory evaluation were to determine to what degree the participatory processes in our urban agroecology research program facilitated authentic collaboration and the role of relationships between researchers, partners, and students in those processes. Inductive coding

identified four broad themes in the evaluation responses (Figure 2). *Participatory processes* and *relationships*, the main foci of our objectives, represented “how” we work together and “who” is in relationship with each other. In addition to these themes, respondents highlighted that *shared learning* was “why” they participated in a community-university partnership and named the ways in which the *social and environmental systems* in which we work impacts “what” we do in the other themes. These themes—and their relationship to who, how, why, and what—build on previous research on urban food justice movements in MSP conducted by Cadieux et al. (2013). Findings for each of these four themes are discussed in this section. We then synthesize trends across themes in the next section to articulate the approach that has emerged from our partnership and propose a framework for future urban agroecology research that facilitates transformative learning.

Participatory Processes

Shared Power

Many partners affirmed that they felt their expertise and knowledge were valued throughout the research process; for example, Caitlin, a farmer with Sandhill Farm, said, “I feel like the entire project was set up based on our consent and insight” (Figure 3). Responses identified that weekly informal meetings between non-faculty researchers, partners, and students during the summer; yearly “All-Hands” Meetings with all program members; and regular email, text, and phone conversations during the rest of the year were all important strategies for shared decision making. Researchers, in turn, expressed commitment to “co-develop” and “co-own” research with partners, including generating objectives, choosing methods, and analyzing and making meaning from the data. Students’ observations supported the importance of shared decision making; for example, Matt, who worked with us for a full year, said, “What I learned through this work alongside community partners is that a collaborative approach is absolutely crucial for strong and respectful relationships that are intended to benefit all parties involved.”

Reciprocity and Mutual Benefits

Shared decision making helped identify relevant benefits for group members. Partners highlighted the benefit of ongoing capacity building, especially soil testing and interpretation that they used to inform farm management practices and address soil contamination concerns. Three partners also highlighted that financial resources, such as stipends, were so vital that they should be expanded. Fannie, a Black female farmer for Knoll Farm, shared,

There have been bits and pieces of conversations that I’ve heard about how the U has all this funding and . . . nonprofit organizations have none, and then Nic has mentioned several times creating ways to partner and collaborate and share, let’s not call it funding, let’s say resources. So, I’ve just become more aware of how you guys . . . are, and could be, a really valuable resource to all us nonprofits or community organizations.

This quote highlights two important community perceptions of the University of Minnesota: that it has significant financial resources and that communities whose residents identify as Black, Indigenous, or People of Color (BIPOC) have been systematically excluded from receiving financial support from them. As undergraduate student Karl articulated, our partnership must “reconcile with academic exploitation of some communities we work with,” past and ongoing.

While financial compensation is irreplaceable, non-monetary resources can also be important benefits. Partners highlighted that shared labor was a valuable benefit; undergraduate research assistants are paid to work with each of the partners for a full day every week of the growing season. Students identified this time as a benefit as well. Dania, an undergraduate student who had been involved in urban garden and farm organizing prior to joining our project, expressed, “I had some connection to each of these partners before this project but not much understanding—now, I know more about each project and their efforts, and I appreciate this.”

Students also highlighted that participatory research allowed them to integrate their work, relationships, and values. Dania and Tulsi—both of whom are women of color—shared that they hadn’t been interested in research before finding a project that reflected their values. Tulsi expanded on this, sharing the impact on her career goals:

Seeing my own values prioritized gives me more hope for the future of academic research. . . . I want to see a shift toward more interdisciplinary research that calls for input from academics of different backgrounds, community members. . . . more voices at the table. I want to continue to explore where these bridges are being built.

Researchers expressed that academia can feel very dehumanizing, but their participatory work restores that humanity. Chip, a hydrologist/biologist at the University of St. Thomas, shared “I was intentional about shifting my research into issues of relevance to our community” because of the sense of purpose it provided.

Challenges of Inclusive Participatory Processes

The participatory processes in our urban agroecology research program, though, were not without challenges. As Nic stated, “university-community collaborations and community engaged-work is always a challenge because it is by nature asymmetrical.” These asymmetries are visible in many ways, including funding allocation discussed previously, perceived legitimacy of different knowledge (discussed in more depth in the Social and Environmental Systems section), and as Fannie named, in the identities of those in different roles:

there’s this inclusivity problem within agriculture, in general, so of course, it’s going to happen with agriculture at the academic level. So, it’s kind of like, okay, these are the scientists, or the people with the knowledge, and they often times look a certain way. And then here are the farm workers, or the laborers, and they often times look a very—certain way, yeah. . . . So it’s just like, there’s those unspoken conversations can be had.

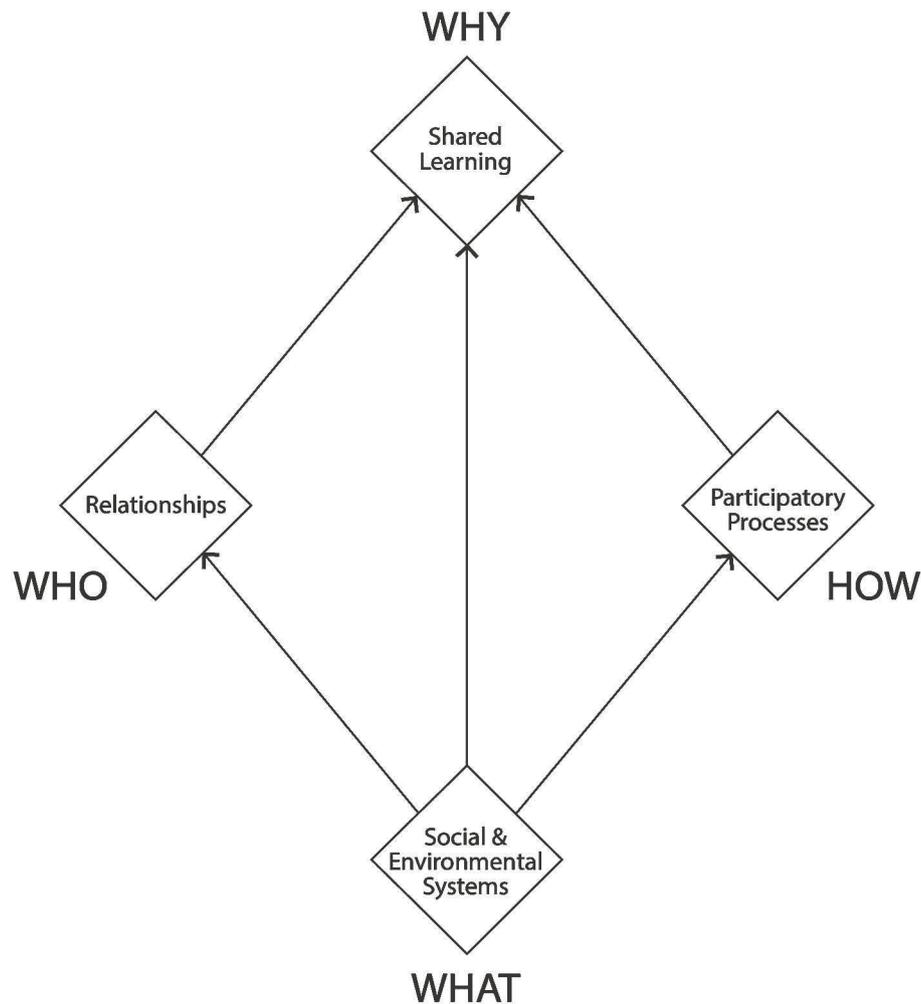


FIGURE 2 | Visualization of coded themes from evaluation responses. Inductive coding elucidated four main themes from the surveys: social and environmental systems, relationships, participatory processes, and shared learning. The content of these themes corresponded to “what,” “who,” “how,” and “why” themes in code books previously developed by Cadieux et al. (2013).

Most researchers are white in this project, and though concerted efforts are made to create a generative space for students (and non-faculty researchers) with identities that are marginalized in science (and society more broadly), the asymmetrical power of universities and communities is still felt and present—even in the bodies of those participating. Kat shared it is often challenging to balance her identities with her role as part of the University; “some days the work may be hard because my brain has to think in many ways and I have to remember my representation.” As a Dakota woman who is white-presenting, Kat has to exert mental and emotional energy to balance the privilege/power of her role in the University with the ways in which her Dakota identity is not seen (or dismissed) by academia and the communities in which we work. Thus, we see ways in which participatory research still grapples with institutionalized racism/colonialism.

Several partner responses, in critiquing the survey’s reliance on the term “collaboration,” also invited our group into a more nuanced understanding of project members’ roles and responsibilities during different stages of the research. While partners helped design the on-farm study, research processes during this study were not always flexible enough to incorporate new directions they took. For example, while collards were chosen as the research crop through shared decision making (Figure 3), the meaning of collards has shifted for partners from a crop that would provide food in their communities to a broader symbol. Sandhill Farm has used the insect damage on some of the research collards to spark conversations with their CSA members around why eating “ugly produce” is good for the environment. For the Coalition, which is based in a vibrant Black neighborhood that has experienced repeated institutionalized wealth theft, the collards have transformed into a conversation about building community wealth. Without a space to rearticulate project goals,



FIGURE 3 | Co-developing research methods—Origins of “The Collard Crew.” Photo credit: Stacy Nordstrom. Pictured (from left to right): Tanner, Kat, Dania, and Madison. Researchers and partners often referenced that an important example of the participatory research process was how we chose the crop for the current ecosystem services project. The pilot study had grown kale—but no one was very excited about having that much kale for 3 years. Over the winter prior to the first field season for this project, Jennifer had one-on-one conversations with each grower about what crops worked best for their goals and, during the yearly “All-Hands” Meeting with all partners and researchers, we used consensus decision making to ultimately choose collard greens. This choice not only better reflects neighborhood and community preferences but also represents a significant research gap; despite the importance of collard greens to Black communities, especially diaspora communities formed during the Great Migration, there is limited representation of this crop in scientific research. Finally, growers expressed appreciation that researchers asked for their expertise in how to harvest, wash, and package the greens to meet their specific sale/distribution needs.

the research process has not been agile enough to incorporate support for these important partner interests.

One reason for this limited adaptability may be that partners who were involved at the beginning of the project (Fall 2017) felt more integrated into the participatory processes than those who joined later, which meant their goals were not integrated effectively. While the *organizations* involved in our group have been consistent since 2016, the *specific people* have changed frequently (**Figure 4**). At the time of the evaluation in Fall 2019, two new growers had joined: Benny and Fannie. Benny, a coordinator for a community garden within the Coalition, joined in May 2018 when he agreed to host research plots, and Fannie joined in February 2019 when she was hired as the farmer for Knoll Farm. They had very different partnership experiences based on *how* they joined the project.

Connecting with the larger group of researchers and partners upon joining the program corresponded with stronger partnerships. Benny did not meet most project researchers or partners until spring 2020, and he felt disconnected from the project because researchers largely coordinated activities with the wider Coalition. As a result, Benny expressed *frustration*, saying “you’re getting the space and there’s nothing that allows us to reap the benefits other than your research at the end.” Conversely, Fannie attended the All-Hands Meeting within 2 weeks of starting her position and noted the value of benefits like stipends, student labor, and outreach activities. While she felt there was room for improvement regarding her power in decision making,

she was *excited* about the prospect of designing partnership goals, research questions, and community connections. Thus, the relationships with other research program members served as a vital support for participatory processes.

Relationships

Our evaluation found that relationships grounded in trust were a necessary foundation for enacting participatory processes. As Nic articulated:

Community-engaged research to me really can be boiled down to one major core. Do researchers have strong interpersonal relationships with community members that go beyond interactions in the context of a project? Do we know each other, do we trust each other, do we eat together, just to listen and be people together? If so, then I think that goes a long way to sustainable community-engaged research.

To better understand relationships between researchers, partners, and students, we conducted a preliminary network analysis (**Figure 5**) based on relationships named by each respondent. This highlighted both the importance of individuals as key connectors and gaps in the relationship networks, while contextualizing relationship-building strategies and opportunities.

Several researchers served as key connectors. Nic, the principal investigator, is an important connector between

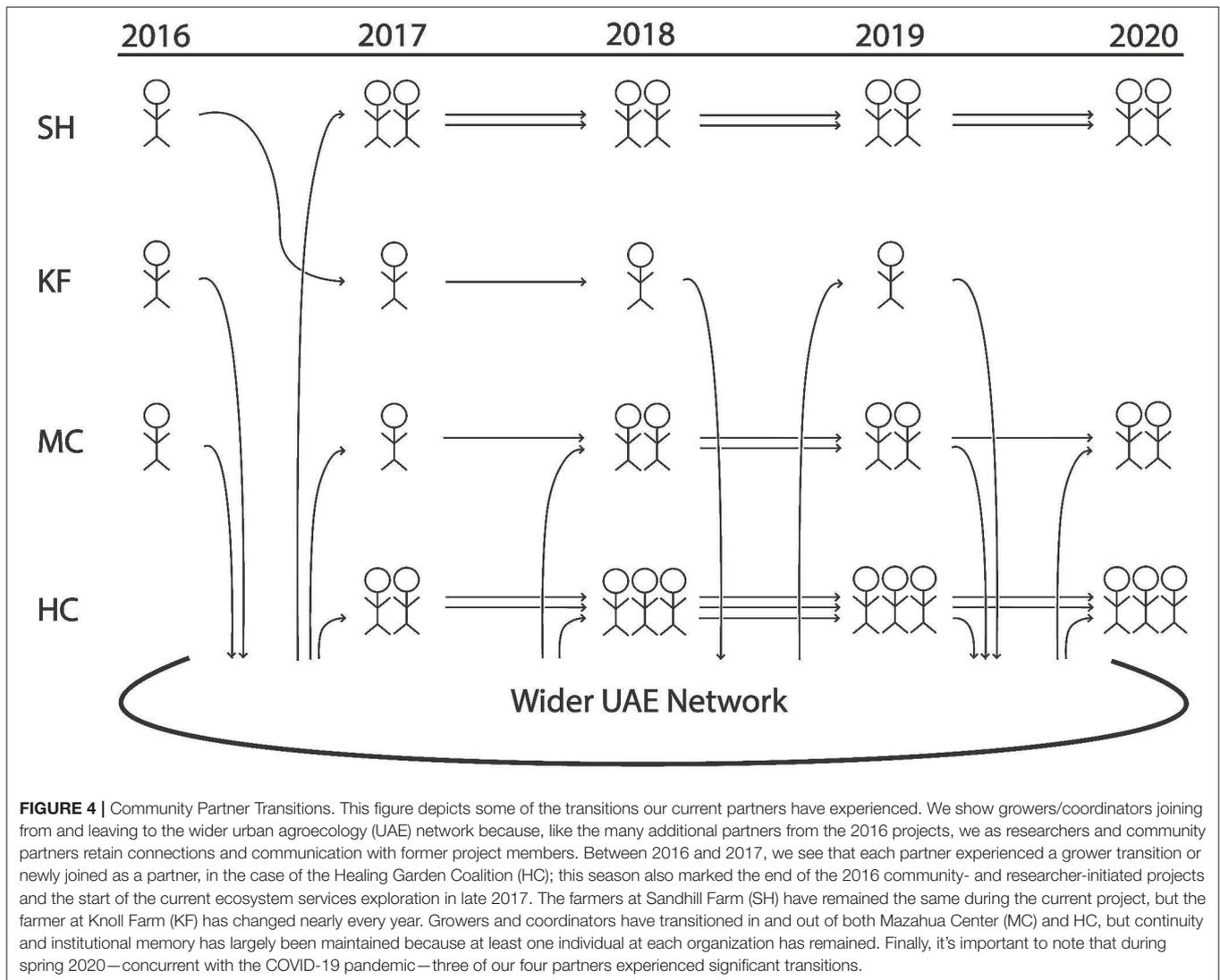


FIGURE 4 | Community Partner Transitions. This figure depicts some of the transitions our current partners have experienced. We show growers/coordinators joining from and leaving to the wider urban agroecology (UAE) network because, like the many additional partners from the 2016 projects, we as researchers and community partners retain connections and communication with former project members. Between 2016 and 2017, we see that each partner experienced a grower transition or newly joined as a partner, in the case of the Healing Garden Coalition (HC); this season also marked the end of the 2016 community- and researcher-initiated projects and the start of the current ecosystem services exploration in late 2017. The farmers at Sandhill Farm (SH) have remained the same during the current project, but the farmer at Knoll Farm (KF) has changed nearly every year. Growers and coordinators have transitioned in and out of both Mazahua Center (MC) and HC, but continuity and institutional memory has largely been maintained because at least one individual at each organization has remained. Finally, it's important to note that during spring 2020—concurrent with the COVID-19 pandemic—three of our four partners experienced significant transitions.

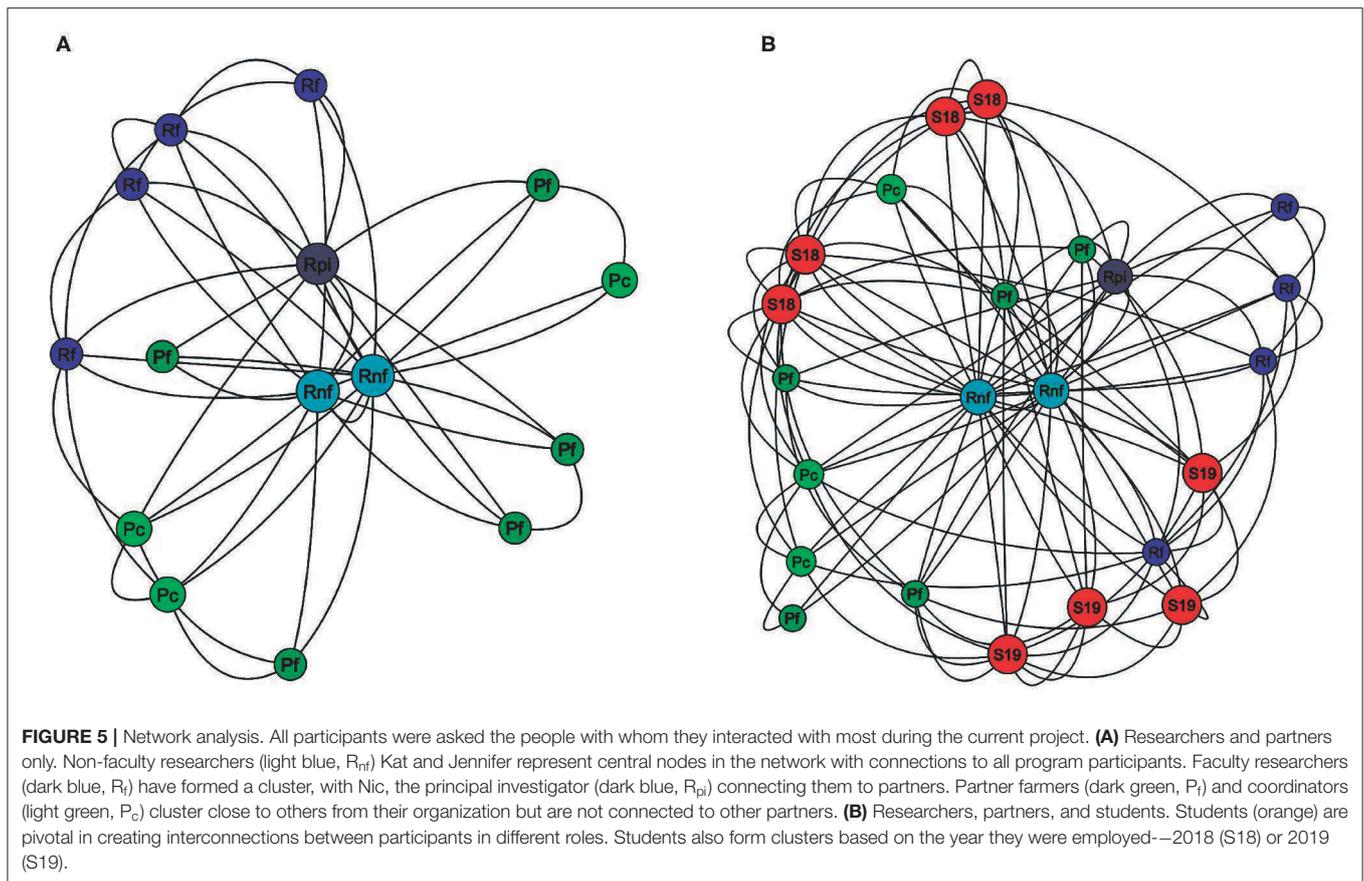
the faculty researchers and community partners. Non-faculty researchers—Kat and Jennifer—are clearly at the center of the network, though, with connections to every researcher, partner, and student. This reflects Kat and Jennifer's role in mediating shared decision making; they checked in with partners every week during the field season and maintained regular communication during the winter. Holding space for so many relationships, however, can also be a challenge; as Jennifer shared, while

I love what I do everyday – literally – I feel like I'm somehow failing at something most days. Some of that comes from trying to put in the time necessary to do community engaged work... [especially] figuring out how to build relationships in different ways with different community partners.

Despite Jennifer's concerns, most partners described close relationships with Jennifer, Kat, and Nic. For example, Amanda, the farmer at Mazahua Center, reflected that "Their positive and

fun energy is always so amazing to be around," and Caitlin shared that their support "helped me open up to feeling confident about grant writing and asking for funding for a big project!"

However, partners also expressed that they generally didn't know the other researchers or partners (Figure 5A). Several partners noted that the existing communication strategies were mediated by the researchers, but they wanted a space or more regular meetings to communicate, build relationships, and share experiences with other growers and to connect with researchers. Other than the yearly "All Hands" meeting, there were no formal opportunities for partners to interact with each other within the project, and other researchers were often only able to attend occasional community events. For example, Mary, a horticultural researcher, noted that she has "multiple responsibilities in the summer months (teaching, research, administrative) and it is very difficult to be regularly present at the research sites. I try to come at least once." The network analysis demonstrates that the All-Hands meeting and community event participation were not enough to



build strong relationships between researchers and individual partners, but responses highlight that they did help integrate researchers into communities more broadly. As Caitlin shared, “We see each other at community meals, fundraising events, educational events and such. They are definitely a part of the community!”

Students, who spent a significant amount of time with community partners each summer, demonstrated some of the ways that regular interactions helped build interconnected relationships (Figure 5B). Each week, students spent a full day embedded with a partner, in addition to attending community meetings and events, and students and partners both identified that eating and working in the field together were important relationship-building activities. As Pepe, the Food Systems Manager at Mazahua Center, commented, “it’s always nice when other people are on their hands and knees weeding and harvesting, and you have that shared labor of love.” However, the limited tenure of most students with the project (sometimes as little as 2 months) did pose challenges. Some community partners expressed that they “need a seating chart” to keep up with the students, while others regretted that they didn’t get to say goodbye and share their appreciation with students before they left. Some students also expressed that their relationships felt unresolved because their community involvement suddenly ceased when they left the project or transitioned to fall lab work; others did not experience this because they decided

to continue as community volunteers past their period of employment.

Shared Learning

While our evaluation objectives were to understand participatory processes and relationship development in facilitating collaboration, the responses also highlighted why program members valued this type of research: the opportunity for shared learning. Reciprocity created space to learn from each other. Pepe shared that inviting researchers and students to the daily free community lunch was an act of reciprocity for the research activities; “I love seeing everyone up there even when I wasn’t a part of it, that Mazahua Center could give something back to y’all. That’s really important to me; reciprocity is important.” Across roles, project members also described the importance of humility; as undergraduate student Madison articulated, “keeping an open mind and being respectful are necessary to learn from others.” Joshua, a co-coordinator for the Coalition, built on this, noting that he appreciated interacting with students because of:

their presence and their presence to stretch. For me, when I use the term stretch is to stretch to listen at meetings and be willing to share. I think about a couple of [community] meetings, I would call one of them out and it’s like a deer in the headlights, but then

they would speak. And for me it's good learning, so they became good teachers.

Together, reciprocity and humility allowed our partnership to value the strengths and skills project members contributed to learn from each other.

Building on the previous discussion of benefits, one reason growers partnered with the university was to learn how research findings could inform their practices. Partners were excited about data and results—such as soil nutrient and temperature data—and unanimously voiced that, as Caitlin exclaimed, they “want to explore the ecological benefits of urban agriculture!” Researchers and partners were unsure, though, how best to integrate our complex data sets with grower knowledge and translate both into applicable tools and resources for farm management and policy advocacy. As Valentine—a food systems geographer and political ecologist—summarizes, “nutrient budgeting and other heuristics that seem like they could be so worthwhile in showing where urban ag fits into the landscape in an Ian McHarg-ian² way may actually be too complicated to be worth the effort.” This was further complicated, Valentine articulated, by researchers trying to avoid imposing scientific ways of knowing on communities: “I think it partly might be that we...are a little too sensitive about taking up community time. So that when people are like, ‘No we don’t want to talk about the research results now,’ [we respond,] Okay, we won’t.” Conversations during the evaluation, though, highlighted that partners valued researchers’ skills and were invested in the project’s scientific results.

Researchers also expressed that they were constantly learning from partners’. Kat noted, “There is no one way to do things...there are so many differences in each farm.” Nic, similarly, shared, “the innovation that is the most fun, and the site and community specificity of urban agriculture...I have learned how much I really need to keep my eyes and ears open to continue learning.” Furthermore, undergraduate students who joined our project wanted to learn how to interweave research and community. Dania, for example, wanted to “learn about how this research model collaborates with community partners to create reciprocal relationships,” and Tanner explained that he learned “making connections with partners, attending events, and community engagement are just as much a part of this project as the data collection and analysis,” which has inspired him to pursue participatory research in his graduate program.

In addition to learning between roles, group members also learn from others in the same role. These connections are seen in the network analysis (**Figure 5B**), where there are clear clusters for researchers and for students (in their respective field seasons)—which indicates the development of cohorts. Researchers noted that some of their longest professional relationships are with other researchers in this group, and we

²Ian McHarg is an important figure in the history of community land use planning, known primarily through his 1969 book *Design With Nature*. McHarg’s “ecology-first” perspective for planning shaped the early history of the Metropolitan Council, the regional planning body for the Twin Cities Metropolitan Area (Adkins et al., 2018). Thus, there is a precedent for an ecosystem-level approach to land use planning in our area.

saw students each year support each other within and outside the project. Many partners and researchers wanted to strengthen these cohorts, especially among students. Hamline and the University of St. Thomas both have students working directly with this project, Bethel University has a strong partnership with our St. Paul partners, and several farms have summer student interns. Fannie, who mentored and managed Knoll Farm interns, wanted to begin the season with an intensive political agroecology education course and to take them on field trips throughout the season but hadn’t had time to implement this yet. The evaluation helped us identify this as a future goal for our partnership.

Partners were also interested in having the opportunity to learn from each other, but there were limited connections between partners, as previously discussed in the Relationships section. Joshua expected to learn a lot more about the Minneapolis partners, and Pepe (one of those Minneapolis partners) said,

I would love to see the other sites...I don’t even know where, who, where are they at? I want to connect with the other people. We got the time and space, we’re like involved in this research too. And by involved, I mean we’re in it.

The opportunity to learn from other growers and organizers was considered a huge potential benefit, and partners named that they wanted to share skills (like soil building strategies), knowledge about grant funding, and experiences implementing programs. They also wanted to discuss larger socio-ecological topics, such as starting reparations, honoring elder knowledge, and the sacredness/love that’s in their garden spaces. As Lily, a Coalition co-coordinator, noted, connections with other growers “expands the consciousness of what’s going on in the field, the urban field.”

Social and Environmental Systems

Finally, the processes, relationships, and learning highlighted were all, ultimately, interwoven with the urban field—the broader environmental and socio-political systems. Survey responses articulated that urban gardens and farms arose as an act of “innovation and creation on the land” to address unanswered community needs. It makes community care networks visible alongside institutional support; Pepe shared, “when we connect community members to community gardens, they don’t visit the food shelf during growing months... We see them start *donating* to the food shelf because they’re growing from a place of abundance.” These acts of creation were often done “as an act of resistance to institutional racism.”

All partners shared that increasing gentrification and displacement are particularly important examples of institutional racism and are impacting their ability to secure long-term land access. For example, the Coalition’s neighborhood experienced severe displacement as a result of freeway construction in the 1950’s and ongoing “urban renewal.” Benny noted that:

a lot of our [church] members were, well, relocated off that strip... And now the majority of our membership is living outside that

2-mile radius. When you think of gardening, you have to have a real intent or a love for gardening if you live 2+ or even 3+ miles away.

Each partner also highlighted that when communities are *displaced from* a place, they are often *displaced to* more polluted areas as a result of racist housing and lending policies. Pepe explained that, “When a government entity finds polluted land, who do we put there? It’s people of color and Natives, it’s new immigrants and refugees, right? I mean, for me, that’s the reason this area is one of the most diverse places in the entire state.” Environmental injustices impacted our partners in many ways, including soil arsenic and lead contamination, proximity to active foundries and industry, and lots where buildings were folded into the soil during construction or redevelopment.

Some viewed partnering with the university as one strategy to build capacity in addressing these challenges. Caitlin noted that many of her potential customers think urban food is polluted, but “I just name drop the research project and the soil testing that’s been available and then their opinion changes in favor of urban farming.” Mazahua Center also noted that the community-university partnership helped them access financial resources and decision-making spaces because funders and policymakers took their work more seriously. It’s important to note that the partners leveraging research in this way are both white; partners who are Black shared that they grappled with the perceived legitimacy of scientific research over the knowledge of farmers, elders, youth, women, and others with marginalized identities. The following exchange between two organizers (Joshua and Lily) and the community garden coordinator (Benny) during the Coalition focus group highlights this dynamic:

Joshua: I don’t like this part, that it’s going to take research to validate good stuff; I’d rather for validation come from an elder or from somebody who does it already.

Benny: You ARE an elder.

Joshua: I’d rather it be validated by ME saying it.

Lily: It is too bad that our elders don’t have more influence and credibility. Because I was thinking that it really does legitimize urban farming and gardening when the university starts to study that, and that’s just how our society looks at stuff.

Fannie affirmed this sentiment in saying “I think while university knowledge is much more valued in our society in general, it’s important to have a program that can acknowledge both, a space for both.” Therefore, it was clear from our responses that while leveraging university power could be valuable, this needed to be done in conjunction with dismantling perceptions of legitimacy perpetuated in U.S. institutions as part of systemic racism and colonialization. Ultimately, these commitments need to guide the research outcomes; as Caitlin expressed, “I want to use the data to steer urban agriculture in the most sustainable direction, and I also hope that the data can help urban ag become an integral part of our city!”

FACILITATING SPACES OF TRANSFORMATIVE LEARNING THROUGH URBAN AGROECOLOGY RESEARCH

Assessing Intent and Impact

When we embarked on this evaluation in Fall 2019, we sought to understand to what degree our participatory research processes facilitated authentic community-university collaboration and learning and the role of relationships in those processes. Our results illuminated and made visible that a framework—a way of being in community with each other—had emerged through our current practice (**Figure 2**): that community-university partnerships supported shared learning through relationships and participatory processes grounded in specific socio-ecological systems. We use “emerged” here in the spirit of systems theory (Meadows, 2008), adaptive cycling (Holling, 2005), and movement building principles (Brown, 2017), all of which describe how properties and systems emerge from complex interactions between people, communities, institutions, and the more-than-human world. This emergent framework also revealed valuable nuance to our overall program goal of supporting community-led transformation in urban food systems: that shared learning was seen as necessary to achieve transformation.

Shared learning was a main reason all project members participated in urban agroecology research. Pepe expressed it best, sharing that other growers had knowledge that:

I don’t have from growing up on a farm, that Amanda doesn’t have with her master’s degree, sorry Nic, but with his PhD...you know a lot about one specific thing. But isn’t that the beautiful concept...it’s all of us working together to have the best results.

Understood in the context of the overall conversations—which focused on community benefits—our results support a belief in collective power articulated by Méndez et al. (2017) and echo recent scholarship that defines agroecology learning as “transformative in politics and practice...as a strategy of social movement mobilization” for socio-ecological action (Anderson et al., 2019). This articulation of shared learning added important nuance to our understanding of the *intention* of urban agroecology research. Going into the evaluation, we focused on its role supporting community-led transformation of urban food systems, but it became clear from our results that the unique contribution of urban agroecology research in relation to community-led efforts was to *facilitate spaces of transformative learning*.

With a more nuanced understanding of the contribution of urban agroecology research, our results also highlighted ways in which the *implementation* of our research was both effectively facilitating and confounding the emergence of transformative shared learning. Our focus on relationships between individuals led to sharing *knowledge and skills*, a CBPR principle (Israel et al., 2008; Gust and Jordan, 2010); while this sometimes facilitated *individual* transformation, such as in Caitlin having confidence to write a large grant proposal for her farm or in student career decisions, it often failed to build the

relationships required for the *collective* learning necessary for systemic transformation (Anderson et al., 2019). Our language to describe participatory processes also held vestiges of individualism. While researcher responses—and broader scholarship (Gust and Jordan, 2010; Méndez et al., 2017)—used “co-ownership” to describe community participation in the research process, partner responses continually redirected conversations toward community wealth and the tangible community benefits, such as the collard harvest or screening for heavy metals in soil. In these interactions, we saw broader trends of communities articulating stewardship and responsibility in ways that transcend ownership—because individual wealth and ownership models support existing systems of oppression and racism (Geisler and Daneker, 2000; Voller, 2018). Through this tension, it became clear that “co-creation” better rhetorically encompassed the intersection between agroecology principles (FAO, 2018) and communities centering collective interdependence (Brown, 2017).

There were many disconnects between relationships and co-creation (participatory processes), which we can see visualized in the lack of direct connection between them in **Figure 2**. We lacked a regular space to share stories with and learn from each other about ourselves, the research, growing practices, program strategies, community histories, and more. As a result, there were missing relationships between researchers and growers and among growers, which prevented fully realizing the shared learning we saw in student and researcher cohorts. Without space to welcome new partners into relationships and co-creation, we missed opportunities to integrate their skills and goals into decision making. Therefore, our results demonstrated the need for a revised framework to connect relationships and co-creation to facilitate the emergence of transformative learning and socio-ecological change so that our impact matches our intent in future research.

A Proposed “Learning Framework” for Urban Agroecology Research

Recommendations about the larger research process that emerged from this evaluation are centered around the need for “embodied spaces” *through* which relationships and co-creation are connected to facilitate the emergence of transformative learning toward socio-ecological change (**Figure 6**). Having a “through” category builds on the previous framework developed by Cadieux et al. (2013), which contained an uncategorized theme describing tensions between rhetoric (intent) and action (impact) across organizations of differing political power. We see the main role of “embodied spaces” as a way to engage with similar tensions between learning about “what is” and to imagine and create “what can be” (Dendoncker et al., 2018), both in our research partnership and at larger socio-ecological scales. “Embodied spaces” —or the seeds of them—already existed in our partnerships through the All-Hands meeting; shared meals and work with partners, non-faculty researchers, and students; and co-leading tours of our study areas during community events (**Figure 7**). For “embodied spaces” to facilitate transformative

learning, our results highlighted the importance of including embodied learning experiences and sharing rituals/ceremonies.

Embodied learning experiences seek to break down the boundaries between mind and body. In our results, student experiences sharing meals and working together in the field with partners showed us that physically being present in a space was important. Partner discussion of what they wanted to share with visitors highlighted how sharing practical/technical knowledge was as important as sharing goals for community change, including critical conversations of socio-political influences and impacts. Through these conversations, as Lily said, “you get to know people really in a deeper way.” This type of learning values multiple types of knowledge, which Pepe, Fannie, and the Coalition all particularly highlighted. This operates from a fundamentally different perspective than the dominant model of extension agriculture education, in which knowledge transfers one way—from the university to growers (Warner, 2008).

Agroecology, as a field, already values this integration; horizontal learning is a central tenet of the transformative agroecology learning framework developed by Anderson et al. (2019). Much of these horizontal learning models have been deeply informed by Friere’s (2000) popular education pedagogy. Many grower-led organizations pursue practical and political education through peer-to-peer networks; for example, activist Holly Baker, in describing a People’s Agroecology Process “encounter”—a gathering for growers to share knowledge—said, “One beautiful part of the experience was that we made sure there was a mix of time for political dialogue and sharing technical skills... Rather than only talking, when you use your body and physical energy, you just get to know people in a different way” (e.g., Black Dirt Farm Collective, 2020). This language closely mirrors our responses.

Within an “embodied space,” sharing ceremonies/rituals enhances embodied learning by creating a space of heightened meaning. We all exist in space all the time, but because spaces are products of interactions and relationships from small to global scales, people experience these spaces differently based on their identities and histories (Massey, 2005). Ceremonies and rituals help us share those experiences with each other; Dr. Shawn Wilson writes “the purpose of any ceremony is to build stronger relationships or bridge the distance between aspects of our cosmos and ourselves” (Wilson, 2009, p. 11). For example, the Coalition opens and ends meetings by having participants share the “one word” they are bringing to and taking with them from the experience, and ritualizes other elements of a circle dialogue process. This mirrors the People’s Agroecology Process, which uses theater, art, poetry, and more into the beginning and end of their encounters (Black Dirt Farm Collective, 2020). Ceremonies/rituals can also mark transitions and the passage of time, such as the yearly Greens Cookoff that celebrates the collective wealth and resilience of St. Paul’s Black community by sharing the collard harvest.

Researchers enact practices and processes (ceremonies) to bring attention to information and create spaces/times dedicated to community meaning making, even if these are often abstract and inaccessible to most people (Wilson, 2009). Gathering our project participants in “All Hands meetings,” for example, marks

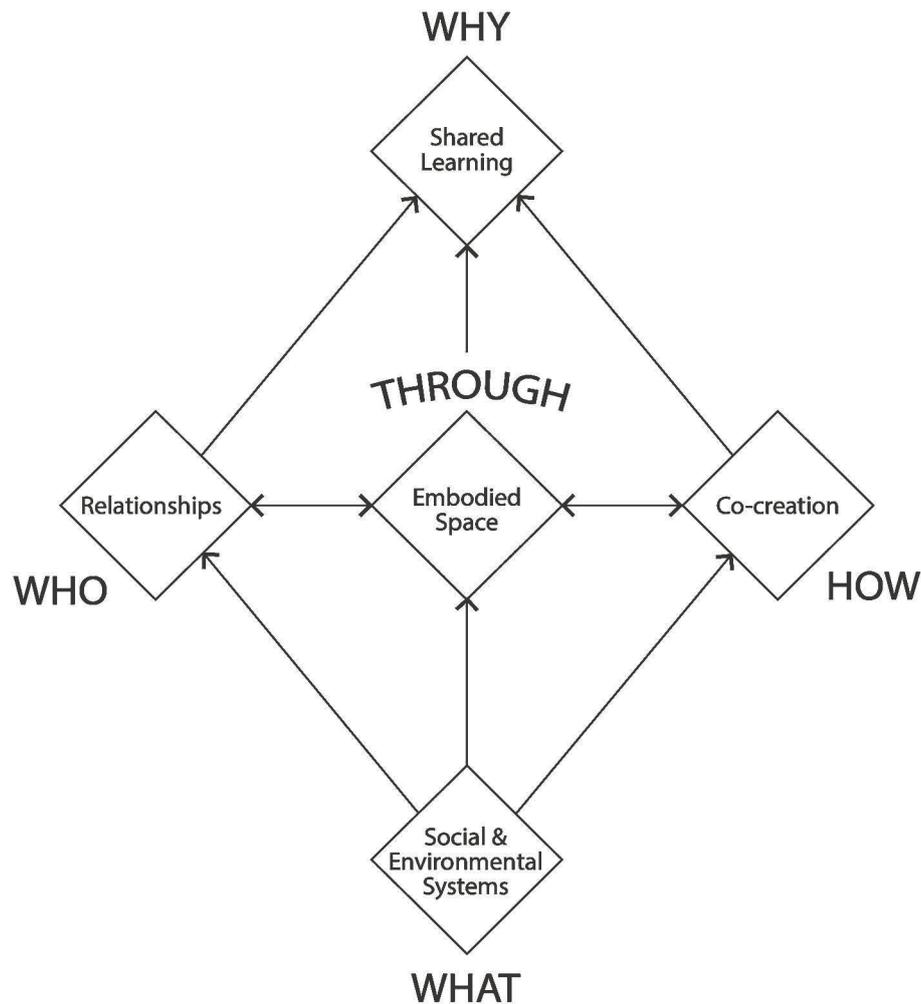


FIGURE 6 | “Learning Framework” for urban agroecology research. Building on themes that emerged from our evaluation (**Figure 2**), we propose that “embodied space”—consisting of embodied learning experiences and shared rituals/ceremonies—is necessary to connect relationships to co-creation of projects and processes. Through embodied space, interactions are facilitated that result in the emergence of transformative learning toward changing social and environmental systems.

the passage of time and ritualizes the sharing of data (**Figure 8**). This space has become more effective as researchers, students, and community partners learn from each other how to inhabit (or at least visit) the performative spaces of collected data, shared analysis, and recommendation building. The evaluation helped us more explicitly understand the similarities and differences in our story sharing habits. The recommendations for “embodied space” in our results shaped our 2020 meeting, and we integrated shared meals, talks, Q&A periods, celebrations, field trips, facilitated exercises, and unstructured time together to open and hold space for all members to explore and communicate what seems important in the project.

When we discuss experiences and ceremonies held in “embodied space” within our project group, we often, more simply, call them “gatherings.” Our responses revealed that integrating more frequent and intentional embodied gatherings would facilitate (1) building relationships with cohorts and

place, which required (2) enacting reparative ecologies in our partnership to (3) support diverse co-creation participation structures (**Figure 9**). Together, relationships, co-creation, and embodied spaces create interactions from which transformative learning and socio-ecological change emerges—as we discuss more below.

Expanding and Deepening Relationships: Cohorts and Place

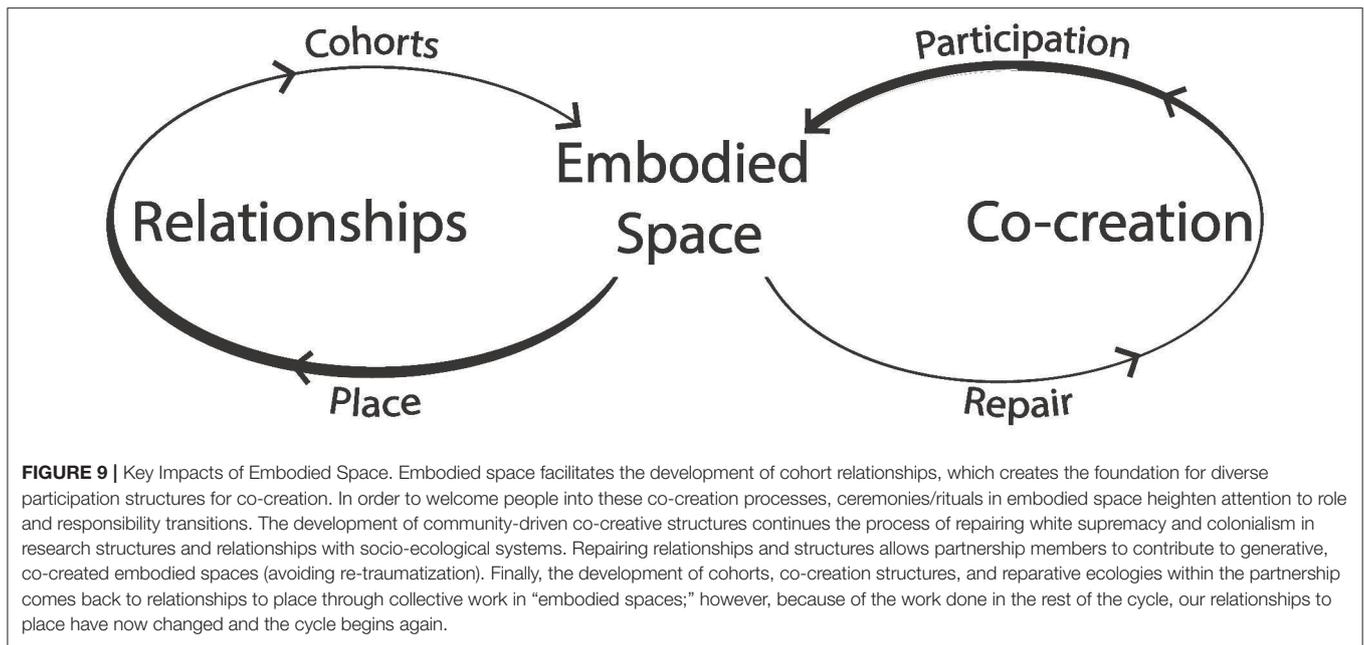
While “people-to-people” power (**Figure 10A**), as Lily calls relationships, are the foundation of our work, the network analysis and responses broadened our understanding of relationships to also include cohorts (**Figure 10B**) and relationships to place (**Figure 10C**). This represents a significant expansion from PAR and CBPR research, one which focuses on traits of relationships, and is inspired by the centrality of relationships in BIPOC organizing (Wilson, 2009; Ramer et al.,



FIGURE 7 | Farm and garden tours as embodied spaces. Joshua (far right) giving a tour of the Coalition's community garden where we have our study plots to the Urban Food System Symposium attendees in August 2018. Undergraduate students were also there to share about the project and answer questions about the plots (from the far left—Karl, Tulsı, and Matt). Embodied learning allowed attendees to physically experience the space of a garden, see how the history of this neighborhood is physically inscribed on the area, and feel the interactions between collaborating groups. Doing so through the ritual/ceremony of a farm tour—so ubiquitous for those working in agriculture—makes these embodied learning experiences legible across different roles, since this circle included urban and rural extension educators, students, researchers, and activists from across the country.



FIGURE 8 | All-Hands meeting as an embodied space. Photo credit: Stacy Nordstrom. Coming together as a full group at the yearly All-Hands meeting is a ceremony/ritual that helps us mark the start of another year, and in 2020, we used results from the evaluation to add more aspects of embodied learning experiences. Here, partners from the Coalition, Knoll Farm, and Sandhill Farm, plus researchers Jennifer (second from left) and Chip (far right), are working through the meaning-making process for the relationship network analysis. Creating physical things to interact with (like the printout and pens) as well as using small groups and circle process are one way that sharing ceremonies/rituals in embodied learning experiences are helping us understand how others share stories and create meaning from symbols.



2016; brown, 2017; Charles, 2018; Penniman, 2018). Supporting the embodied space of gathering especially facilitates building relationships with cohorts and place.

Cohorts are groups of peers in agroecology “with whom to process learning, address issues, be vulnerable, and be inspired,” as articulated in the agroecology graduate education pedagogy being developed by students and faculty at the University of Minnesota (Nicklay et al., 2017; Wauters et al., 2019). Building on responses that articulated goals for strengthening student cohorts, cohorts for growers and researchers would provide an important support network to engage in embodied learning experiences, which in turn would cultivate the trust, humility, and respect necessary to be in relationship and work with each other. Grower cohorts, as Fernandez et al. (2015) writes, are “the backbone of the agroecology movement globally” because centering knowledge sharing and regenerative practices/perspectives decenters and creates alternatives to extractive systems (Varghese and Hansen-Kuh, 2013). There are many existing examples of cohorts in grower-led initiatives, such as “base groups” within encounters in the People’s Agroecology Process (Black Dirt Farm Collective, 2020). Cohorts including researchers and growers are less common—likely due to complications caused by asymmetrical power relations—but were recently proposed as “wisdom councils” in the transformative agroecology learning framework Anderson et al. (2019) developed based on their work in Europe.

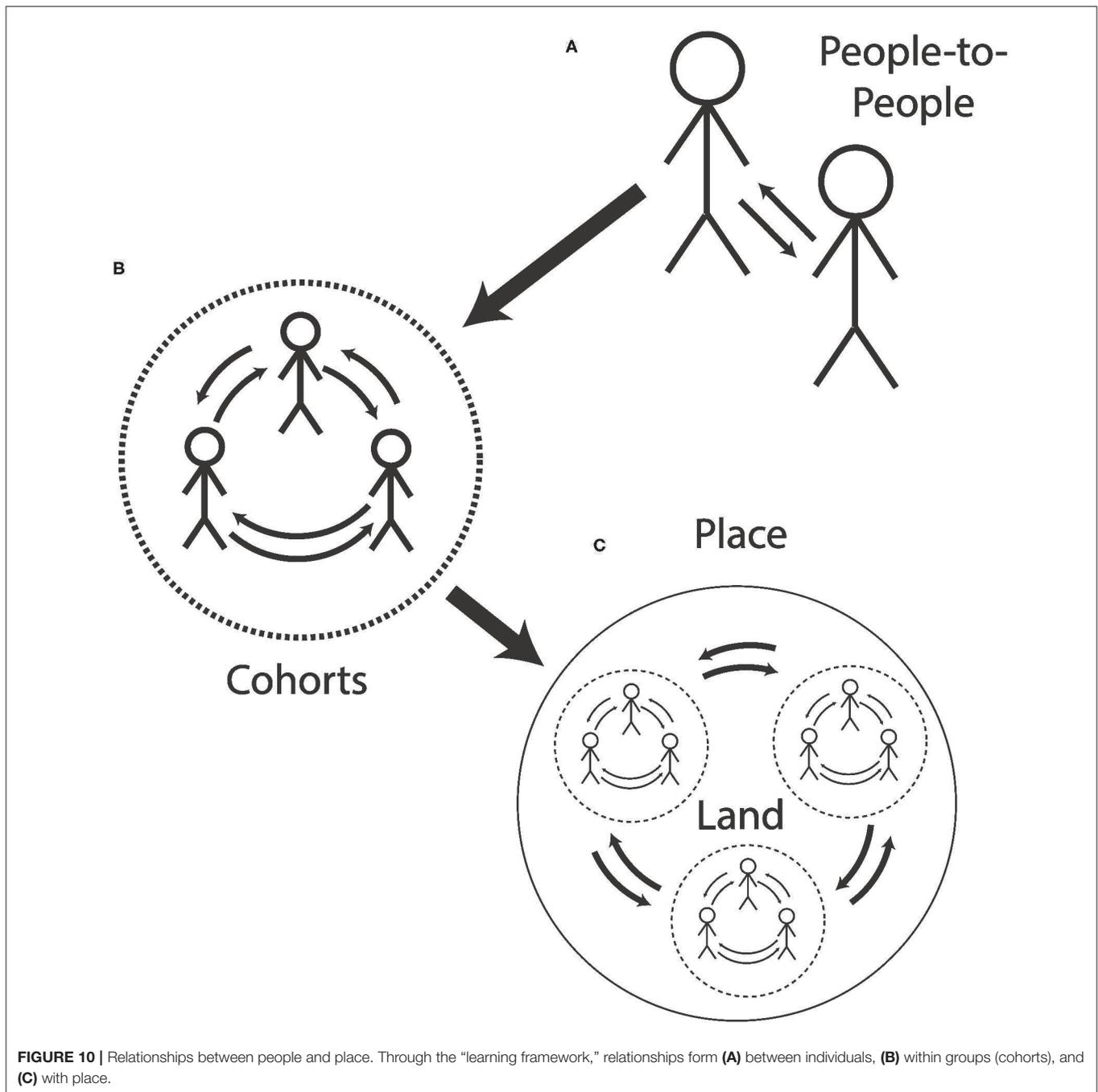
For multi-role cohorts to thrive, ceremonies/rituals are necessary in order to make symbols used by researchers, partners, and students legible across roles. As Kat says:

both sides have to put themselves in a place of possible discomfort to learn from the process. Whether it’s learning the scientific process and understanding the terms, or learning how to communicate that information in a way that anyone can

understand. Neither of the sides have it ‘easy’, we have to work together to understand each other.

Ceremonies and rituals—such as the yearly All-Hands meeting—create space to hold that tension and discomfort to translate between different knowledge cultures, discourses, and fundamental understandings of what is valuable in urban food production. For example, growers, researchers, and students might share their rituals around recording information. Farm plans, lab notebooks, and R code may at first glance seem very different, but these rituals start a work period (whether that’s a season or day) and help us process information in our respective roles. Sharing ceremonies/rituals requires coordination, extra explanation, and offers good cheer and solidarity that helps participants suspend habitual disinvestment in others’ detailed symbolic lifeworlds, and engage in cultural boundary crossing and learning.

Through cohorts engaging in learning experiences and ceremonies/rituals at farms, gardens, community centers, labs, parks, and other sites that are important to partnership members, gatherings also build relationships to place. We use “place,” to encompass the farms/gardens, food systems, environmental dynamics, histories, communities, wider socio-political forces, and embodied lived experiences that all interact to create our social and environmental contexts (Tornaghi, 2014; Solin, 2015). Place—and relationships to place—are complex, representing deep connections to land and community. Our results showed that using gatherings (including field research days and walking tours, in addition to regular field work or informal time together) to connect to place allowed students and researchers to engage with complexity in a way that is usually difficult within academia. For example, when Pepe invited researchers and students to community lunch, it was a way to welcome us into the wider community, into some of the central social relationships that



are integrated with the reciprocal socio-ecological stewardship Mazahua Center facilitates. Madison reflected that, over the course of embodied experiences throughout the summer, “I learned about environmental racism and how sometimes minorities do not have the option to live more sustainably. In order to combat climate change, we need to also combat racism and inequality.” Therefore, the relationship to place cultivated in gatherings that attended to embodiment in space facilitates research—and learning communities more generally—that holds, witnesses, and documents complexity, rather than

attempt to control it or direct it toward extractive “development” (Checker, 2011).

Repair Ecologies

Gatherings, called “lighthouses” by Montenegro de Wit (2014), have the opportunity to create space for embodied learning where cohorts come together as coequals. Creating a space that removes barriers to participation and supports coequal gathering, within a research partnership, however, requires repairing relationships of harm, violence, and extraction implicit

in our current land, food, and academic systems (see Lee and Ahtone, 2020 for one example). As we saw in the results, asymmetrical power relations are just as present in participatory research and manifest in the identity of participants in different roles, differing experiences relating to intersectional identities, funding allocation, and the perceived legitimacy of different types of knowledge. However, while it can sometimes feel, like Nic said, that these asymmetrical power relations “by nature,” they are created, supported, and perpetuated through systems and institutions—such as the “feed the world” narratives that arose out of productivist development paradigms (Bowness et al., 2021). One of our most important areas for work—especially as researchers—is to deconstruct and repair the systems that cause them. PAR and CBPR scholarship acknowledge this but propose few tangible strategies to deconstruct colonialism and white supremacy beyond participatory processes themselves, which ultimately serves to “re-inscribe white, patriarchal systems of power and privilege” (Bradley and Herrera, 2016). Our results indicate that participatory processes alone are not enough to reconcile and repair individual relationships, cohorts, community-university research programs, or larger scale socio-ecological systems.

Embodied learning experiences structured around repair, however, do provide an opportunity to enact decolonization and anti-racism. Repair is described as a two-pronged approach to critically engage with socio-ecological crises toward building community capacity (Cadieux et al., 2019), which builds on the previously described political and practical learning done through embodied spaces. While analyzing responses, partners highlighted that this dual approach of critique and healing is rooted in a long tradition of community driven efforts in MSP, as discussed in Cadieux et al. (2019), where

highly networked groups of farmers, gardeners, and academic-activist organizers working in the Twin cities have facilitated the emergence of reparative agroecologies... These efforts have built community action and resistance on the margins of capitalist development and state governance. Simultaneously, they have made demands on state, finance, and non-profit actors for redistributive programs and reparations-based land and financial access (654).

We saw this dual organizing approach in partner discussions of leveraging scientific knowledge and legitimacy in our responses, and it is important that embodied learning experiences focus on how practices can be applied “on the margins” and how to demand that existing systems change.

This includes demanding that white researchers and students practice their own healing and repair work as they awaken to contemporary coloniality (both systemically and within their own bodies) so they can participate in embodied spaces without retraumatizing people with marginalized identities (Menakem, 2017). In our results, researchers were overly cautious about imposing scientific norms and narratives on communities because of the ways in which science has often been used to reinforce existing systems of power and oppression. This meant that researchers deprioritized sharing information about our

scientific work, which resulted in a missed opportunity because partners valued that knowledge! Therefore, it’s clear that we need to pair deconstructing whiteness in research, which has been a consistent thread throughout our project’s iterations (Frank et al., 2017), by pursuing individual and collective repair in order to participate in this work as co-equals.

As Mary observed, “We haven’t built in enough from the racial/social equity piece, but I view this as an opportunity and have ideas on how we might address it as we grow.” Jennifer highlighted that facilitating a multi-racial program—especially as a white woman—required a significant amount of training and internal reflection:

I don’t know how I would do this work without all the social justice, anti-racism, and decolonization work and training I have done for the past 10+ years. The learning curve would have been so much steeper not only in connecting with community partners, but also in sufficiently supporting students in navigating these complex situations.

This is especially work for researchers to do as a cohort, because individual healing requires support and shifting institutional structures requires collective healing (Menakem, 2017). Partners mentioned inviting and supporting researchers, as well as students, into their work in significant part because of the potential role their research could play, in turn, in supporting communities to heal from structural traumas (such as the manifestations of environmental racism discussed in the Social and Environmental Systems section) through co-creating embodied ways of being with urban agroecologies. Inflecting embodied learning spaces with this possibility also includes creating labs, departments, institutes, and universities that are generative and inclusive, rather than dehumanizing. This will build on the value-based culture identified in our results by students with marginalized identities and is one step to addressing the lack of BIPOC representation among researchers.

Researchers and students, once doing the internal healing work, can then contribute to embodied learning spaces in a reparative way by reimagining the kinds of data and knowledge our research frameworks support. In the Introduction, we discussed that Urban Agroecology has space for systemic, asset- and strength-based research approaches. Ceremonies and rituals in embodied space help us understand the important symbols others use to represent the benefits of urban farms and gardens. This, in turn, supports embodied learning experiences because understanding important symbols across roles helps us examine negotiations over what justifications and evidence are being used to support access to and governance of land for food cultivation. It also helps integrate complex researcher and grower narratives to inform management practices, a significant challenge to sharing knowledge identified across roles in our results. In our project, many of the metrics of ecosystem services have been selected because, through farm tours with growers and organizers (a regular ritual every field season), we noticed the continual refrain that “soil health is community health.” By focusing on this value, among others, we were

able to avoid re-traumatizing communities negatively impacted by scarcity and deficit narratives that arise from reductionist science and instead create a reparative research approach that focused on community values and strengths (Cadieux et al., 2019).

Diverse Co-creation Participation Structures

Repair is focused on “negotiative collaboration, mutual recognition, and consent” (Cadieux et al., 2019, p. 654), which, in combination with interconnected networks developed in cohorts, would promote horizontal learning and leadership structures (and also alleviate the pressure non-faculty researchers feel as the central relationship nodes). Valentine shared that her hope that

Our approach would help enable the researchers to get solidly behind some community goals – recognizing that these goals might themselves be emergent and dynamic. However, I am wondering whether there’s a process the community partners might LEAD at this stage (like an action planning process) that helps re-articulate these goals going forward.

Reparative co-creation asks us to imagine the full range of ways communities can lead research and outcomes within a horizontal learning structure. Participatory research is often portrayed as a spectrum, with activities ranging from outreach to community-based action (Ellison and Eatman, 2008) and relationship types ranging from manipulative to collaborative to participant controlled (Arnstein, 1969; Bacon et al., 2005). To avoid harmful or extractive research, the implicit goal in much participatory research is to aim for *the most* community participation in the research possible, though research processes that aren’t grounded in repair often can’t achieve participant control (Arnstein, 1969; Post et al., 2016). However, this centers the *research* activities themselves rather than strategically thinking about how different skills and activities can contribute to the overall goals of the community-university partnership and the wider community.

Within our project, one way we’re already experimenting with different roles for community led research is through on- and off-farm projects. In the on-farm project, the relationship between growers/organizers and researchers is best described as a collaborative partnership because they were involved in decision making and implementation throughout the research process (Bacon et al., 2005). However, the relationship between community partners and researchers for the complementary off-farm research conducted by Chip is consultative. This doesn’t mean either type of relationship is better or worse; in fact, both are necessary for communities to drive research agendas in order to use the full research tool-kit—applied, basic, legal, policy, social, and more. This welcomes more researchers into community-centered programs by making space to value the unique skills of community partners and also the participation of researchers who may not be organizing their current work around CBPR/PAR.

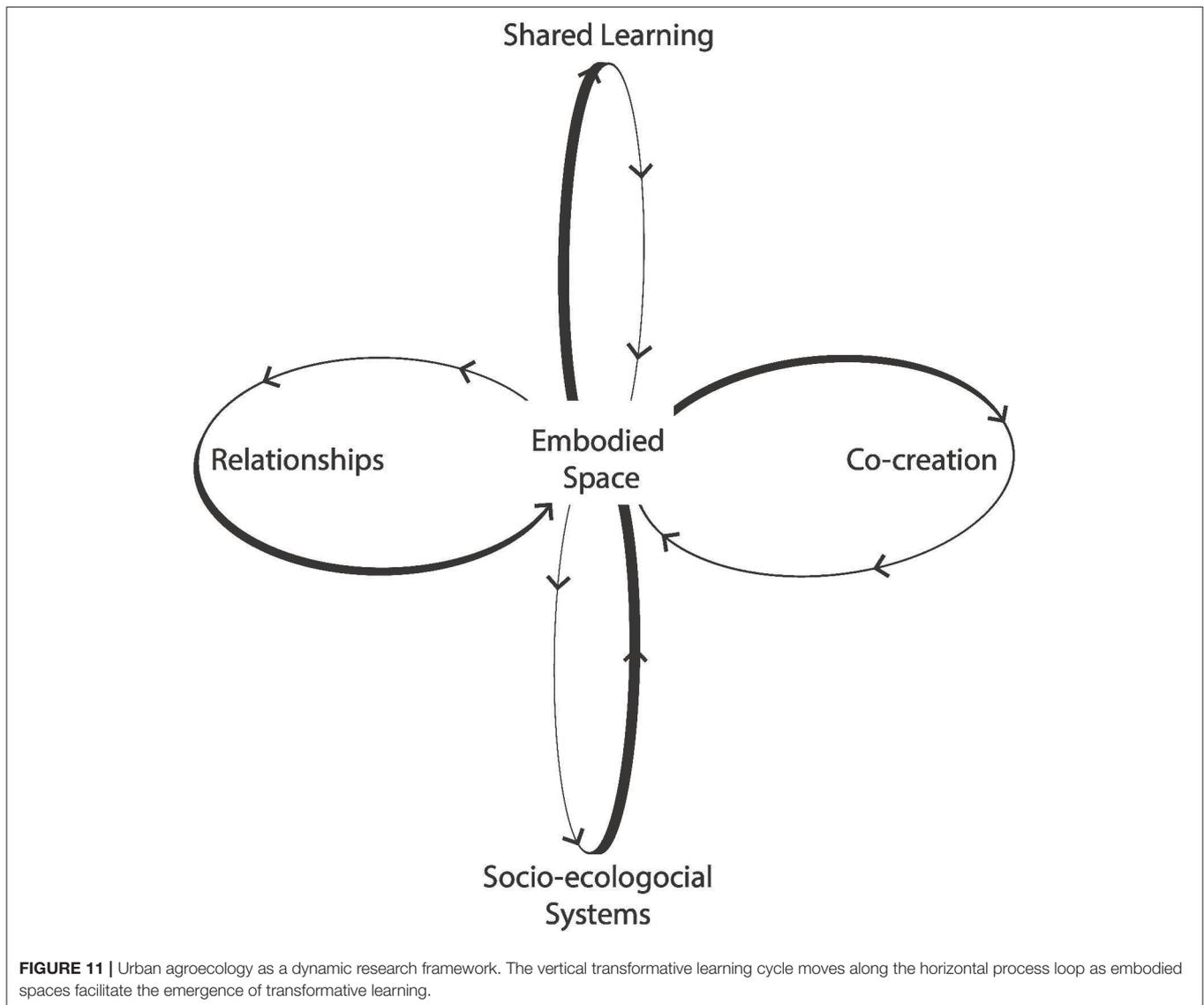
Embodied learning in cohorts sets the stage for developing the relationships necessary to support diverse co-creation approaches and make the products/outcomes visible to all

involved through the collective work activities. Regular return to embodied learning experiences would facilitate activities that continually make changing goals, strengths, and needs visible, which would help community-university partnerships navigate the spectrum of co-creation options. Without these, it is easy to fall into old models of “helicopter research.” For example, in the absence of planned meals or field work, Benny observed that, “There wasn’t a lot of conversation...it seems as though you’re focused on the task that you’re there to do.” Dania named discomfort in this situation, sharing “it felt strange to just extract data and leave a space.” However, other times when we offered help, it was sometimes rebuffed (usually when we hadn’t built broad enough relationships with a community partner for them to trust our competence at providing help without requiring more supervision than they had capacity for). Using embodied experiences to solidify roles and needs with each partner can help better communicate expectations and capacities.

Ceremony/ritual helps mark transitions as people change roles and responsibilities, which becomes especially important if there are multiple co-creation paths operating at one time. In addition to the partner transitions (Figure 4), students transition between roles; Tanner and Dania were involved in community urban agriculture programs before joining the project, and Tulsi transitioned from student researcher to Knoll Farm intern. In 2020, as a result of COVID-19, Knoll Farm took a year off from farm production, so Fannie transitioned to join the research team. Ceremony marking changing roles would allow us to indicate to group members that they are taking on new responsibilities. We see how the formal scaffolding of welcoming someone into a role, or a project, creates the excuse to repeat content and build social relationships that might otherwise be felt as repetitive or hard to justify asking collaborators to spend time on. Adding practices to create, maintain, and end relationships ensures that all group members—no matter how long they are part of the project—are integrated into cohorts and co-creation processes.

Scaling Out: Facilitating Multi-Scalar Transformation

Through this learning framework, we aspire to a community-university urban agroecology research program that invites researchers, partners, and students (and others!) into a liberatory community where everyone is transformed. Embodied space continually “calls us in” to recommit to transformative learning and drives iteration through relationships, repair, and dynamic co-creation. These iterations build new structures and innovations within the research program, which, as adaptive cycles posits, become the seeds for multi-scalar, systemic transformation (Holling, 2005). This transformation process is represented in similar ways across many fields: adaptive cycling in ecology (Holling, 2005), local spiritual leaders use an infinity loop to represent inward and outward transformation (Sit, 2020), and many Black community organizers use fractals to show patterns repeating from small to large scale (brown, 2017). In this spirit, Figure 11 represents a more dynamic representation of the learning framework in which we can imagine the vertical



“transformative learning” cycle moving dynamically along the horizontal “process” loop.

There are several avenues for further research, as well, both locally and across many urban agroecology research sites. This evaluation (and the subsequent learning framework) did not gather information about relationships between members of our partnership and external individuals, institutes, and places. We did not have conversations with *former* partners, which could provide valuable context and also provide an excellent opportunity to update people on the project’s activities (and invite them into the partnership again if it matches their goals and interests). Finally, COVID-19 complicates physical gatherings, and we haven’t fully explored what embodied spaces look like in this context, for small group gatherings or for virtual embodied spaces. Our research in general, and these questions specifically, are drawing from calls by community partners—locally and in other cities (Drake, 2015, p. 274–76)—for researchers to be embedded in the communities in which they’re working while

also continually interrogating whether the goals of our program are having the intended impact to repair structural inequities (Barthel et al., 2013, 2015).

In sharing how this learning framework emerged from our work, we hope to provide tools and inspiration for other community-university urban agroecology research partnerships. It has already deeply informed our work so far in 2020, from the implementation of the yearly All Hands meeting to our response to the COVID-19 pandemic and the Uprising for Black Lives that was initiated by the murder of George Floyd in Minneapolis. Through uncertainty, rage, grief, fear, and determination, this framework kept us focused on being in relationship with each other as we provided urgent support to each other and determined which parts of our ongoing research projects could be let go and which parts were important for long-term community goals. Our framework was developed in a specific context, but the systems of disinvestment and repair which we are facing are not unique to our area. The U.S., generally, is reckoning with ongoing

systemic racism, and around the world, there are inequities and movements for justice being embodied in spaces of urban food production—and researchers are part of these spaces. Applying the framework in other areas, then, requires attention to the ways in which those differences will impact our work. Our world is in a moment of rapid transformation, which means that the seeds and structures we put in place now may expand beyond our individual efforts and, collectively, have impacts we have not yet imagined.

CONCLUSION

Urban food production in MSP is often pursued as one way to transform ecological, social, and political systems by mobilizing “egalitarian grassroots solidarity and new forms of dispersed power” (Cadieux et al., 2019, p. 645), thereby contributing to the emerging realization of urban agroecology. This paper has engaged with the tension around how researchers can be in community with growers, organizers, policymakers, and residents to support systemic transformation through urban agroecology research. Within this context, it is necessary to reimagine how we do research; to that end, we’ve proposed a learning framework for community-university urban agroecology partnerships based on our experiences as a 5 year community university partnership and the themes that emerged from a participatory evaluation we conducted in Fall 2019.

Urban agroecology research represents a unique space to come together as co-equals and use a process of transformative learning to facilitate being in relationship with “what is” in our environmental and socio-cultural systems to imagine and create “what can be.” In order for learning to transform everyone involved, relationships to people, cohorts, and place are integrated into co-creation processes through “embodied spaces.” Within these spaces, community-university partnerships share embodied learning experiences and ceremonies/rituals that repairs our internal structures so we can, in turn, transform larger scale socio-ecological systems through community-driven actions. As Dania said in her evaluation:

From my experience, urban agriculture has always been driven by community efforts and ultimately many urban agricultural projects are community-based. If we are to do research on urban agriculture, especially in efforts to support these communities, then we must be actively working and collaborating with community partners. These are the people who are doing the work, therefore the research needs to recognize that.

DATA AVAILABILITY STATEMENT

The datasets generated for this study are available on request to the corresponding author.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by Hamline University Institutional Review Board. The patients/participants provided their written informed consent to

participate in this study. Written informed consent was obtained from the individual(s) for the publication of any potentially identifiable images or data included in this article.

AUTHOR CONTRIBUTIONS

JN, MR, and KC led development of the survey and led data analysis, with support from NJ. JN created the online survey, conducted one-on-one interviews, and managed the data. JN and KC conducted the focus group. Writing was led by JN, MR, and KC, with support from NJ, KL, and GS. All authors and community partners participated in designing, implementing, and revising the partnership processes upon which this paper is based. All authors collectively conceived the idea for the evaluation survey. All authors, community partners, and undergraduate research assistants reviewed the instrument.

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and Ahtone, 2020). The land was ceded in the Treaties of 1837 and 1851, but when the U.S. later abrogated those treaties, the land was not returned to the Dakhóta, as is legally required when treaties are revoked (Case, 2018). We also acknowledge that the University of Minnesota received financial support in 1856 from William Aiken Jr., who enslaved more than 700

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Conflict of Interest: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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