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Making Architecture Relevant to Underserved Communities: Mapping Reconsidered

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Abstract: The COVID-19 pandemic and the death of George Floyd shed new light on longstanding disparities that exist in low-income communities of color and impact their overall well-being. Architectural educators and practitioners across the United States are engaging in public discourse to debate the role that architecture should play in promoting diversity, equity, and inclusion in education and the architectural profession. This trend has motivated us to ask: How can architecture be made more relevant to underserved communities? This article investigated that question via the construct of mapping. Mapping is a mechanism for reflection, rediscovery, and reexamination of the familiar and self-discovery of the less familiar. To further explore how mapping can help make architecture more relevant to disadvantaged populations, we used a mobile mapping station (MMS)—a practical, hands-on, community-based project conducted in Detroit. This article focused on MMSs, exploring how, when coupled with social justice values and equitable development principles, architecture can be made more accessible to broader populations.

Keywords: COVID-19; relevant architecture; undeserved communities; equitable development; social justice; mapping; community participation

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1. Introduction

In 2020, a year that was marked by the COVID-19 pandemic and George Floyd's death, underserved communities of color suffered more severe health, social, and economic hardships than did affluent or white communities. Since that time, concerned architectural educators and practitioners across the United States have engaged in extensive public discourse about how best to advance justice, equity, diversity, and inclusion in academia and the profession. How can architecture be made more socially responsive to underrepresented communities in the face of racial tension in the post-pandemic era? This is the research question we used to frame this study.

Before we explain how we addressed the research question, it is important to provide some context for this research. Our community-based service-learning studio has a long-standing working relationship with our partner community, collaborating on diverse projects including bike parks and a memorial garden. In 2017, community leaders wanted to create a planning process that would be educational and promote collaboration across various neighborhoods out of concern over a weakening sense of community and disappearing historical assets (lost to the spread of vacant land and gentrification). These community leaders asked our studio to build on a previous hands-on project we led with middle school students. That project was based on a series of workshops titled "How to Create an Ideal Neighborhood with Children", using small-scale physical models, maps, and photo and video diaries.

A series of community discussions led to the idea of using mapping to create an engagement process that would allow middle and high school students to play a key role and would bring neighborhoods together for collaboration. Through this process, the community hoped to discover community assets, educate children and residents about the value of those assets, explore opportunities to leverage them for good, and establish social

infrastructure to facilitate future development opportunities. Our paper describes this project, explains how it would achieve the community's goals, and details the outcomes and impacts. In so doing, we assert that mapping offers a viable tool for making architecture more beneficial and relevant to underserved communities.

In this paper, we addressed our research question with the concept of mapping. We explain how we interpret mapping in our study, how it can be used to benefit underserved communities, and how it can help make architecture more accessible to their residents. In the literature review, we explore the utility of mapping. Before we explore mapping, however, it is important to discuss what the idea that architecture could be "relevant" means or entails by noting when architecture offers greater relevance to under-resourced populations and what constitutes relevant architecture. To ground our responses, we begin with several theoretical sources of inspiration that underpin our position.

For the purposes of our article, we focus on mapping, but we also employed other methods to actively promote community engagement and participatory design. We used mapping and various other methods to conduct the project, the focus of which was to create a mobile mapping station (an MMS—a practical, hands-on, resident-focused project). Following our description of the plan, we identify the key participants and explain the process, outcomes, and impacts of the project.

We organized our article based on the following multi-faceted framework. First, in the literature review we introduce three theoretical foundations from the interdisciplinary literature that inspired our work and supported our position regarding what constitutes relevant architecture. The foundations focus on three key barriers to making architecture more relevant to underserved communities and four social justice values that we believe should inform efforts to address those barriers. We then introduce mapping as our key method, along with other strategies, for promoting community engagement and implementing our project. We then detail the results of the project, explaining who led it and how it proceeded, and then present the results. It is important to note here that we introduce four strategies for establishing inclusive, equitable, and socially responsive practice to strengthen the project; these strategies are a consequence of the project team's gaining new insight and knowledge through extensive community engagement. In discussing the project's impact, we examine whether we achieved the community's goals and assess the impact of the project on the project participants and the community. In the conclusion we acknowledge the study's limitations and contribution to architecture and interdisciplinary literature.

2. Literature Review

2.1. Theoretical Inspiration in Support of Relevant Architecture

We draw our inspiration from three partially overlapping schools of thought: Public interest design (PID), architecture as spatial agency, and democratic design.

2.1.1. PID Taxonomy as a System of Scaffolding, Mapping, and Overlapping

We interpret "relevant" architecture primarily in the realm of public interest design. PID is often characterized as "socially responsible design", or "design that serves the disadvantaged." Among the various conceptualizations, the PID taxonomy proposed by Kim [1] as an educational and research tool for advancing PID is useful for our purposes. The PID taxonomy builds on a number of concepts to advance the public good. The taxonomy uses the concept of scaffolding to promote inclusion in PID and integrate the broader public interest into mainstream architecture. The notions of mapping and overlapping supplement that of scaffolding. Moreover, Reed's model of learning by mapping across situations [2] complements Anderson's scaffolding concept.

Anderson's conceptualization of scaffolding [3] and the PID taxonomy function similarly as a framework the aim of which is to seek clarity, through mapping, regarding where PID stands within contemporary architectural practice. By elaborating the mapping concept through the idea of learning by mapping across situations [2], we can find a proper

stage (or stages) in the larger design process where PID models, individually or collectively, contribute to practice. Moreover, in aggregate, Kim's nine broadly defined types of PID are used as scaffolding to map design practices for the broader public good and to benefit more diverse constituencies.

Alstyne and Logan [4] built on Anderson's idea, suggesting that the various models overlap. Building on their ideas, we suggest that PID typologies and their applicability to various stages in the design process likely make architecture more responsive to increasingly diversified social conditions.

Alstyne also cited the emergence of innovative tools (such as the arrival of new types of practices or technologies) and the urgent need to use them to advance design through, for example, overlapping different types of applications or methods (e.g., PID typologies) in design. This also means that a designer can overlap various PID types, use them as design approaches, and apply them at varying stages of the process; or the designer can use the types to address diverse public concerns in the design process. These authors' works, taken together, suggest that the PID taxonomy, through the use of the concepts of mapping, overlapping, and scaffolding, advances diversity and inclusion in design practice.

2.1.2. Spatial Agency

In addition to mapping PID types, we also draw inspiration from similar earlier efforts that involve the mapping of "alternative" design practices. The spatial agency model proposed by Awan et al. [5] is particularly relevant to our study. In their book *Spatial Agency: Other Ways of Doing Architecture*, the authors mapped socially engaged practices by building on Bruno Latour's actor–network theory and a theory of agency. Success in making architecture more relevant likely depends on an architect's willingness and ability to act as a co-partner, that is, as a change agent on behalf of the communities she or he serves, so as to build a network of partners and supporters and advance the public interest. An effective and willing actor and agency alone will not be enough, however, to ensure that relevant or accessible architecture is achieved. Also needed is a democratic design process facilitated by a socially responsible agency [6].

2.1.3. Democratic Design Process

Both PID and a spatial agency require a democratic process when designing for the broader public good in increasingly complex pluralistic societies. While a PID practitioner and a spatial agency might prefer distinct strategies to achieve democratic ideals, three partially overlapping concepts drawn from planning and the related social science literature are worth noting as applicable to the achievement of architectural relevance.

First, collaborative rationality involves complexity—namely, in overcoming the challenges of complexity, fragmentation, and uncertainty [7,8]. Second, the deliberative practice model entails encouraging citizen participation in key decision-making, building working relationships, and addressing differences [9]. Lastly, communicative action focuses on the role of information in the decision-making process and calls for information to be produced and agreed upon via substantive debate between key players. Communicative action uses a social process to develop shared informational meaning and advocates for the use of many types of information, not just "objective" information [10]. These three influential works aim to advance democracy in the twenty-first century while simultaneously addressing the complexity and pitfalls of democracy.

While PID practitioners may use diverse approaches to promote public participation, power imbalances between service providers (e.g., universities) and service recipients (e.g., communities) could inhibit the inclusion of residents in key planning decisions [11]. A powerful anchor spatial agency might dominate the planning process, negating grassroots resident participation [12]. Although democratic planning is essential to equitable development, it remains challenging practically to ensure that residents play a leading role in governance [13].

2.2. Lessons from the Literature, Social Justice Values

Our theoretical inspiration has motivated us to address several barriers that might undermine public-interest design, spatial agency, and democratic practice, thereby preventing architecture from serving disadvantaged communities effectively: power imbalances, in our case the asymmetry in power between experts and the lay public [14,15]; lack of resident participation in key decision-making [16]; and lack of equitable access to resources, opportunities, and essential services [17].

A diverse body of literature addresses these barriers, but certain social justice values in practice deserve attention, as they are associated with various challenges that underserved populations face in their efforts to build or rebuild community. Below, we introduce four particular social justice values and explain how advancing those values is necessary to make architecture more accessible to underrepresented groups.

The first social justice value that architecture should prioritize is relevance, which reflects the appropriateness of an architectural service for a target community. Any architectural change or initiative should be grounded in unique local contexts and any community intervention should be led by local actors [15,18].

Equity is central to an effective community development intervention, and the concept of access plays a key role in achieving equity [17]. Underserved communities need greater equality of access to various types of services and amenities, including essential places such as hospitals, grocery stores, and parks [19]; opportunities and development tools that promote minority business development; and land use that makes goods and services available in resource-poor neighborhoods.

Governance serves to shepherd community development across a target community in a democratic manner. We consider "inclusion" and "rights" essential to achieving an effective governing process. A governing mechanism needs to be inclusive, and its participants need to engage in outreach targeting minorities and under-represented groups in community meetings, on planning or governing boards, and in key decisions [9,20,21]. Regarding rights, governance that fosters social justice requires participants to conduct all work and interactions in accordance with the environmental, legal, social, and political rights of the communities served.

Participatory engagement is essential to an inclusive and equitable development process. Opportunities to participate in planning and decision-making processes are required to enable community partners and practitioners to expand opportunities for minority and under-represented groups [22–24].

These four social justice values, if achieved systematically and collaboratively by key actors, can create pathways for promoting enhanced quality of life in underserved communities [25,26]. Accordingly, an architectural service or intervention that advances these four social justice values should be more effective at improving the emotional, social, and physical well-being of affected individuals.

In the next section, we introduce mapping, explaining its attributes and its application to architecture and our community-based project. We also investigate the role that mapping can play in addressing the three barriers mentioned above. We also explore how the four social justice values can be integrated into mapping and assess whether such engagement can lead to more inclusive and equitable practices.

3. Methods

3.1. The Utility of Mapping

This article reconsiders mapping as an approach to making architecture more relevant in the context of disadvantaged communities. Mapping was chosen because of its wide availability and rich utility. We explore how the utility of mapping is pertinent to our research. The purpose of this exploration is to understand types of utility obtained through mapping that can contribute to making architecture more inclusive.

Various types of mapping utility exist. For our purposes, we grouped these types of utility in alignment with the three barriers mentioned above: power imbalance, lack of

resident participation, and lack of access to opportunities and services. Doing so enabled us to explore which mapping functions are most suitable for addressing each of the barriers (Table 1). To aid this process, our study team, which consisted of students, faculty, external design jurors, and community leaders, organized a series of workshops to conduct various practical, hands-on, community-based exercises including categorizing, coding, and consensus-building (Figure 1).

Table 1. Mapping applicability.

Functions of Mapping	Target Barriers	Social Justice Values Needed
Re-presentation Storytelling Rediscovery of the familiar –	Lack of resident participation	Relevance
Observation Reflection –	Lack of access to opportunities and services	Equity
Archaeological inquiry Anthropological analysis –	Power imbalance	Governance
(Architectural) Representation Visual communication Surveying (technology)	Lack of resident participation	Participatory engagement

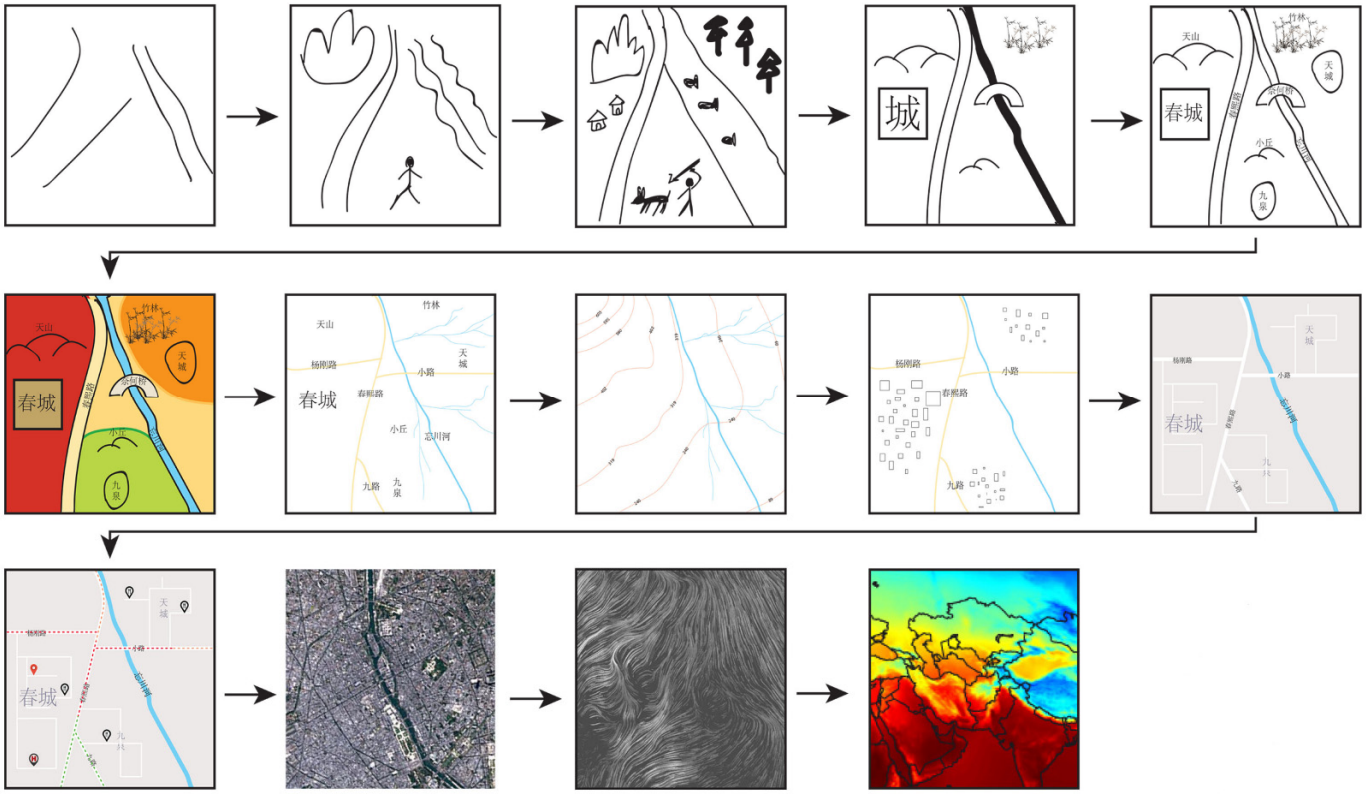

Figure 1. An example of results of a reflective mapping exercise.

3.1.1. Approaches to Improving Access to Opportunities and Services

Observation and reflection, two mapping functions, support assessments that identify essential places, services, amenities, and opportunities that communities lack. It is equally important to understand whether residents have equitable access to essential services and amenities that exist in their communities. Such an investigation requires local residents' own observations and critical reflections. The outcomes of such work can

also improve architects' understanding of where a given community may need technical assistance and outreach to increase equitable access to land-use resources and economic development tools.

3.1.2. Approaches to Encouraging Resident Participation

To encourage resident participation, mapping offers two sets of strategies: the first set includes re-presentation, storytelling, and rediscovery of the familiar. The second set consists of (architectural) representation, visual communication, and surveying (technology). Functions in the first set enable residents to tell their own stories about their communities, as they know their local contexts better than outside experts (e.g., architects) do. Thus, it should be more effective and meaningful if residents lead the rediscovery of their own communities, after which their stories should inform architectural practice.

On the other hand, the second set of mapping functions can be performed more effectively if architects—as technical knowledge generators—and residents—as local knowledge generators—work as partners. This is because architectural representation, visual communication, and surveying requires a certain level of technical knowhow. Successful implementation of the associated tasks, however, requires participatory engagement with local knowledge experts such as long-time residents, as their lived experience contextualizes architectural exploration so that it resonates, shining a light on the humanity and identity of the community served.

3.1.3. Approaches to Addressing Power Imbalances

Archaeological inquiry and anthropological analysis represent two important applications of mapping. Archaeological inquiry focuses on the analysis of material culture or records of artifacts, architecture, biofacts or ecofacts, sites, and cultural landscapes [27]. Anthropological analysis is the study of people, past and present, with a focus on understanding the human condition both culturally and biologically; thus, anthropological analysis is concerned with human behavior, human biology, societies, and linguistics [28].

Comparatively speaking, archaeological inquiry focuses on material culture (e.g., essential places), while anthropological analysis focuses on humanity (e.g., the quality of life). When utilized together, they form a combined approach that is useful for investigating exclusionary practices or infringement of residents' social, cultural, and political rights and their rights in their cities or communities (e.g., the right to access essential services and live a healthy life).

Archaeological inquiry and anthropological analysis are, therefore, useful for learning about power imbalances that result at least in part from the underrepresentation of neighborhood voices and the neglect of disadvantaged populations' rights to use a city's services and opportunities; both practices can lead to unsatisfactory human conditions. Furthermore, both archaeological and anthropological inquiries can also be used to help local actors install a system of governance that facilitates collaborative decision-making, one that is inclusive and respectful of the environmental, legal, social, and political rights of the communities served; such a governing mechanism would be useful for shepherding community development or architectural interventions toward the realization of a common vision.

In summary, mapping affords several partially overlapping functions such as representation, reflective exercises, and observational opportunities. Mapping educates students and seasoned practitioners to inform critical analysis and design thinking through incorporating the techniques of rediscovery, re-presentation, archaeological inquiry, and anthropological analysis. Mapping is connected strongly to visual communication, with an expanding digital emphasis on surveying technology in the realm of architectural representation. Moreover, mapping is related to architectural practice, with its growing attention to adaptive reuse via digital documentation and re-presentation of existing contexts. The surveying and storytelling functions of mapping as well as the rediscovery of the "familiar"

constitute meaningful initial work on the ruins of the urban heritage that shapes inner city neighborhoods.

Many of the functions of mapping discussed above also facilitate the promotion of community engagement in our project. We conducted the project at our architecture college's community-based studio in Detroit. We used participatory planning and design primarily as well as several hands-on workshops where mapping played an important role in community engagement. In our presentation of the results of the project we provide more details about the participants, process, and outcomes.

In the next section, using a case in Detroit (i.e., our project for this article) and building on the four social justice values, we illustrate how mapping could play a role in making architecture more effective in serving underserved communities. We examine how effectively the project promotes the four social justice values and demonstrates the potentiality of mapping as a way of advancing inclusive and equitable architectural practice in underserved communities.

4. Results

4.1. Grandparents' MMS 1.0

A long-time resident in the study community told us: "Growing up, I did not take many pictures of my neighborhood because I truly believed that it would be there forever as a thriving community. But several decades later, the community is a sea of asphalt, vacant homes, and overgrown empty lots. Many assets that exhibited, preserved, or symbolized our community's rich culture and pride have disappeared, leaving little trace of our history" (Mr. Robbins, who is in his 90s).

The MMS, or mapping cart project (AKA Grandparents' MMS 1.0) was conceived in 2017 during a community meeting between our community-based studio and leaders of a community development organization based in our partner community (Detroit West). Inspired by the stories of Mr. Robbins and other long-time residents, a group consisting of undergraduate (with some graduate) architecture students, middle and high school students, and some parents and grandparents decided to develop the MMS project for the community. While the group (project team) coordinated the project collaboratively, the community leaders made key decisions from inception through completion regarding the objectives, direction, planning, and implementation of the project. Furthermore, the community leaders decided and the project team agreed that middle and high school students would participate directly in research for and the design, planning, and construction of the MMS, while being mentored by and working closely with architecture students, with the children's parents and grandparents leading community engagement.

The MMS project was the result of collaboration between an underserved historic community (Detroit West) and a community-based studio at our architecture college. Primary participants included local children, their parents and grandparents, and other residents of the community as well as architecture students and volunteer design jurors. The studio invested several semesters in the project, as our work emphasized flexibility and consideration for all engaged in the study. Some months or semesters involved no or few project activities as a result of illness or family obligations among key resident participants.

The purpose of the project was to provide opportunities for middle and high school students to work with architecture students to design and build an MMS and use it to promote adult-endorsed community engagement.

Architecture students focused on learning how to mentor middle and high school students to help the latter understand the benefits of mapping and its usefulness in urban design and community rebuilding. In conjunction with the mentoring strategy, architecture students used asset-based community data (ABCD). They also learned how to use mapping to conduct civic engagement and to engage residents in mapping to explore what is possible in the community and how the community could be strengthened by leveraging community assets.

For the benefit of the community at large, the middle and high school students focused on learning basic techniques for designing, building, operating, and applying an MMS to community planning. Moreover, community leaders, through mapping and other methods, sought to engage the neighborhood in activities that could foster a sense of belonging (e.g., bonding with one's own block), promote collaboration with other neighborhoods within Detroit West, and build partnerships with groups beyond the community.

Considering the interactive, educational, participatory, and resident-focused nature of the project, it was designed as a practical, hands-on activity. For example, we organized field trips enabling middle and high school students, their parents and grandparents, and other residents to visit various facilities at our university and other locations (e.g., maker labs, 3D printing labs, libraries, design studios, and design-and-build labs). We also organized workshops for middle and high school students focusing on various relevant subject areas (e.g., mapping, coding, planning, designing, physical model-making, and construction) (Figures 2–8).

Figure 2. MMS research and design.

Figure 3. MMS construction.

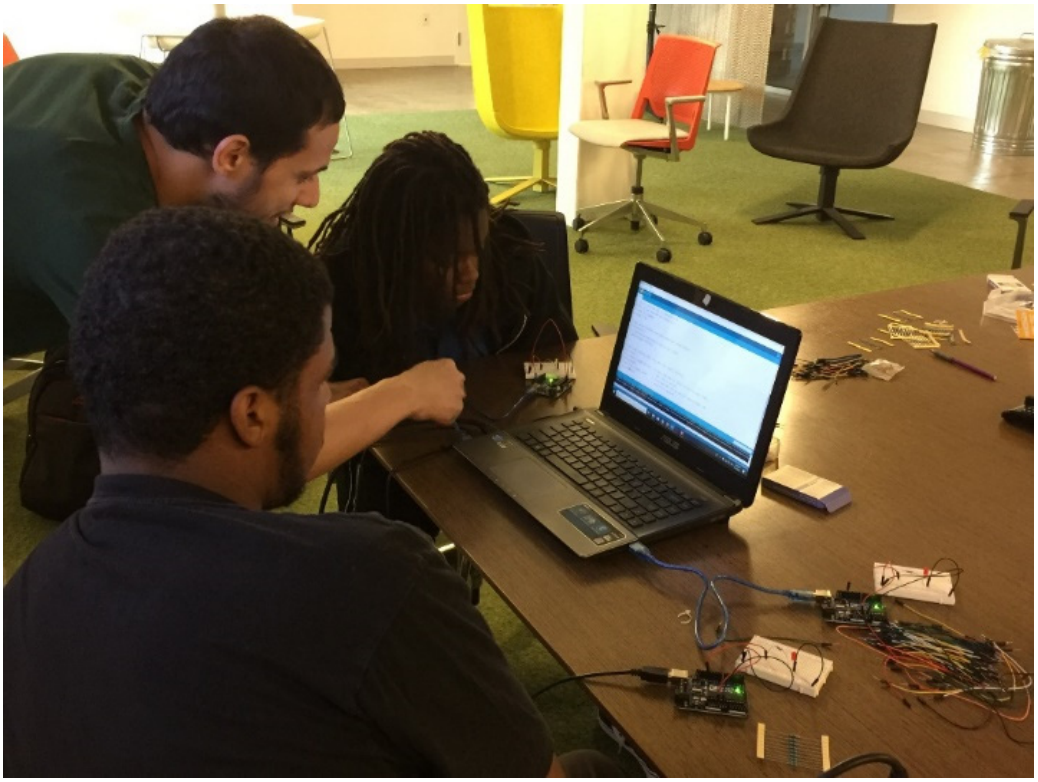

Figure 4. Middle and high school students working with architecture students on coding.

Figure 5. Middle and high school students working with architecture students on mapping and design.

Figure 6. Testing a completed MMS and pulling it by bicycle.

Figure 7. An MMS donated to and installed at the Detroit Public Library.

Figure 8. An MMS at night.

4.2. Four Inclusive and Equitable Planning Strategies

Through extensive discussion, workshops, interviews, and surveys with community leaders, long-time residents, and other key players, the project team determined that mapping alone cannot adequately address the broader disparities facing underserved communities. Doing so requires an integrative framework that, for example, aligns mapping with socially responsive, inclusive and equitable community planning or development efforts. This work, informed by previous models devised by scholars, including Kim and Sanoff [29–32] and others, consists of several specific strategies: inversion (reversing the conventional planning process), reciprocity (exchanging roles), simulation (bottom-up experimentation), and research-in-action (just-in-time, tactical research) (Table 2).

Table 2. Inclusive and equitable planning strategies and social justice values.

Four Social Justice Values (Listed to the Right) Four Inclusive and Equitable Planning and Development Strategies (Listed Below)	Relevance	Equity	Governance	Participatory Engagement
Inversion			X	
Reciprocity		X		
Simulation	X			
Research-in-action				X

The group used the concepts of inversion, reciprocity, simulation, and research-in-action to organize a planning process. Also, mapping was used to support the process where necessary.

4.2.1. Inversion

Inversion involves building on a community's vision and then using it as a guide to define the goal and scope of community revitalization, research, and data collection. This tactic reverses a conventional method of identifying problems or collecting data first and only afterwards finding solutions or proposing a community vision.

Our partner community offered a long-held vision for creating sustainable "multi-purpose bike parks" (MBPs) and linking them across the community. Our project team used that community vision as a guide to determine MBP locations and conducted further research to support the work with mapping. The community also agreed that MMSs would be made accessible to and stationed in MBPs.

Archaeological inquiry and anthropological analysis, two mapping methods, were used for studying and choosing promising locations of MBPs and MMSs. The outcomes of these two mapping approaches helped local leaders form a community-wide governing process to determine final MBP locations in a democratic manner, as a number of neighborhoods within the study community wanted to see MBPs installed in their preferred locations (Figures 9 and 10).

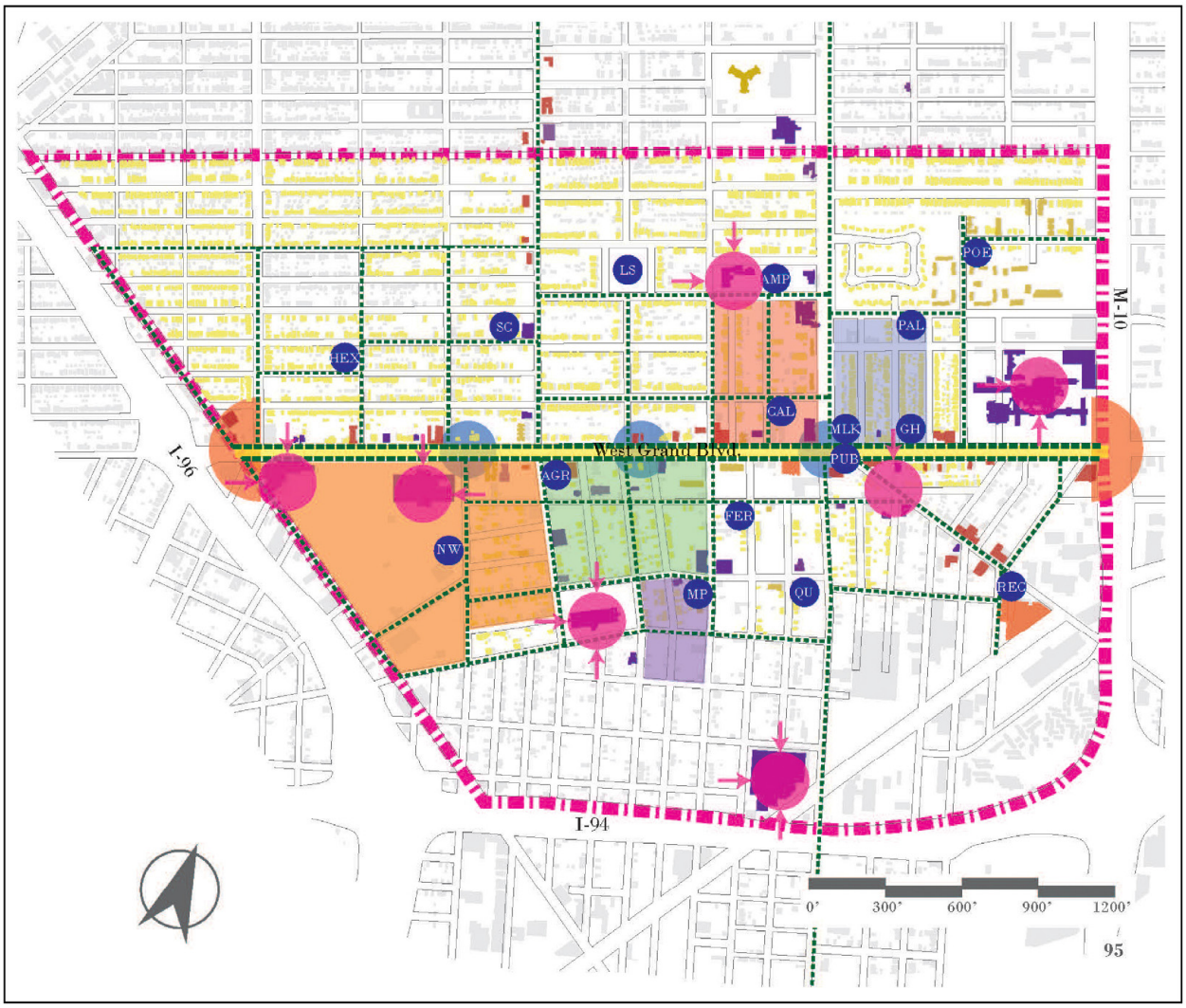

Figure 9. An example of a community vision concept map showing MBP locations (multi-purpose bike parks: dark-blue small circles).

4.2.2. Reciprocity

Reciprocity provides an opportunity for designers (including architecture students) to put themselves in the shoes of non-designers (middle and high school students and other residents) so that all participants learn to be empathetic and respectful of each other during the design process.

The project team used role-play in some processes (Figure 11). For example, middle and high school students and architecture students switched roles or played different roles other than their own, including those of city officials, school teachers, homeless people, firefighters, and many others to help them understand the perspectives of other community members and learn to have compassion for them.

Figure 10. An example of an MBP (+ educational facilities) concept map with access to an MMS (arrows indicate proposed MMS access and circulation).

During some of the mapping workshops, children and parents called attention to several locations in the community. They mentioned places frequented by the homeless, streets that flood repeatedly, and sites of burnt-out houses. The group expressed shared compassion for those found in unfortunate circumstances and brainstormed the idea of creating MBPs in those locations for healing and memorialization. The group also proposed using an MMS to map various locations for the purposes of preservation, observation, and reflection on various types of traumas that may exist in the community.

4.2.3. Simulation

Through simulation, project participants focus on small-scale experiments that even laypeople can conduct on their own or with minimal help from designers. Small-scale experiments are a powerful means of sharpening our intuitions, overcoming indecision, and testing ideas without undue baggage [33] before rolling out a plan or project on a large scale.

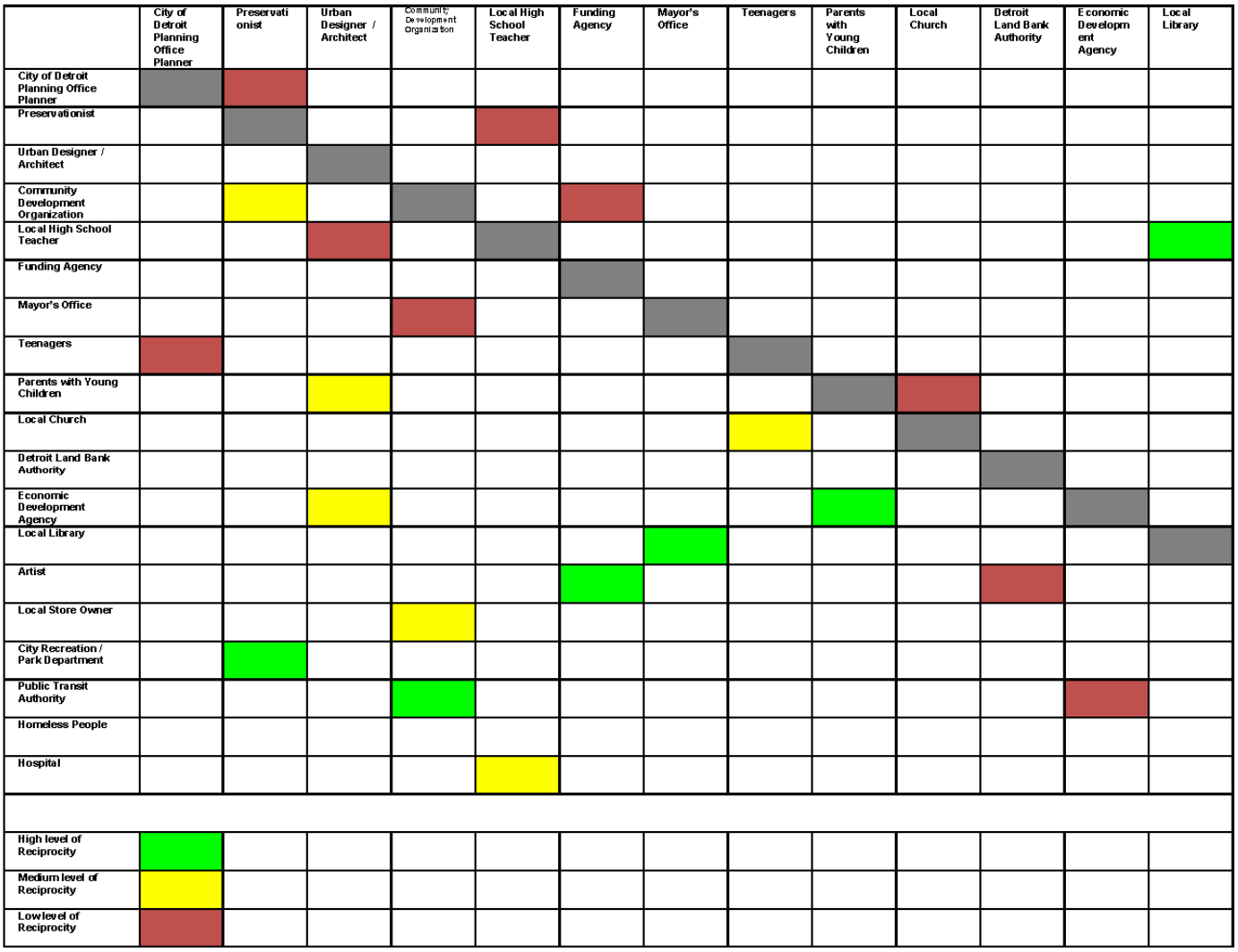

Figure 11. An example of reciprocity (a workshop team used a chart like this to strategize how to implement the reciprocity model). Note: This chart is used for role-playing by a team of two people; green stands for a high level of reciprocity (suggesting that both members in a given team agree 80 to 100 percent that each member plays their respective role well in contributing to a given project in its workshop(s); yellow stands for a medium level, i.e., 60 percent; brown stands for a low level, i.e., 20 to 40 percent; and gray signifies "not applicable" (N/A).

The project team constructed several small-scale models of MMSs in the studio (Figure 12). After testing them against several criteria (durability, mobility, suitability, and alignment with MBPs, among others), the participants went through a series of modifications and decisions regarding MMS design and construction. Considering both MMSs (making a product) and MBPs (making a site plan and community master plan) together is a complex undertaking for students, especially for local children and residents. Thus, input from various stakeholders in the community, local officials, and external design jurors was important. The lived experience of long-time residents was particularly useful, especially when they shared memories of otherwise forgotten historical places and accurate accounts of what once existed on now-vacant land, and described how places have evolved over time. The outcomes of these engagements were incorporated into simulation exercises.

Figure 12. An example of simulation (proof-of-concept models were developed prior to designing and building a full-scale MMS).

To further support residents' decision-making (e.g., what to simulate), to document the lived experiences of the residents, and to map types of "memories-in-place" that are more appropriate for constructing a community's new reality (including a community vision, i.e., an MBP-networked community), the project team used various mapping strategies, including re-presentation, storytelling, and rediscovery of the familiar.

4.2.4. Research-in-Action

Research-in-action involves small-scale, short-timespan research to test design ideas, repeating the process to inform design as often as time permits. This helps designers (technical knowledge generators) and residents (local knowledge generators) execute practical research in a mutually beneficial and timely fashion.

Considering the size of a community that consists of many small neighborhoods, and facing the complexity and extent of broken urban and social fabrics in the foreground—while the background contains a rich cultural landscape—the project team recognized the need for adopting a more practical research approach. Thus, the team used a research strategy that is based on co-operation between local knowledge experts (local actors) and technical knowledge experts (e.g., architectural students, faculty, and external design jurors). Through this strategy, the participants conducted short-span tactical research and repeated it as often as time permitted. The consensus was that engaging as many small teams of residents (representing their own blocks or streets) in conducting research in as many locations as possible throughout the community would be more practical and appropriate for their "micro-level" contextuality (i.e., block-level, street-level, and neighborhood-level).

The local knowledge contributed by residents and their children enriched the architects' technical work and enhanced the architectural representation and surveying technical work in each small team's research efforts. In addition to these two mapping strategies, the small research teams also used a visual communication system that is mutually beneficial to both non-designers and designer members. In applying the mapping techniques of representation, surveying, and visual communication, local actors engaged in key decision-making; they co-developed, with designers, a graphic language for mapping that both sides could use and understand (see Figure 13).

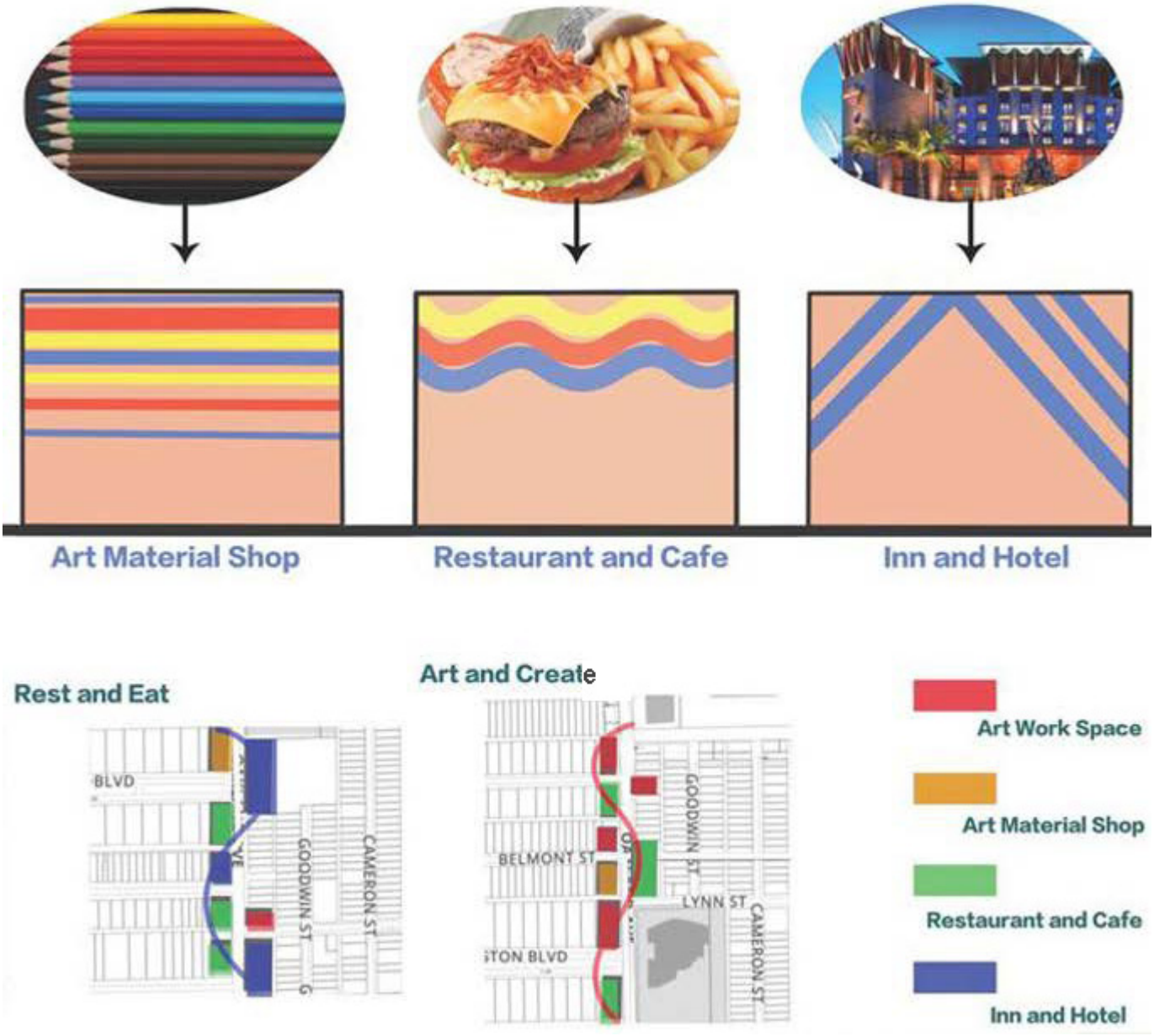

Figure 13. An example of a graphic language for mapping (co-developed by residents and designers).

4.3. Community Manual

The four abovementioned approaches to social justice were incorporated into a manual for conducting community engagement to be led by the community leaders. The manual's purpose is to aid leaders in addressing one of their major project goals, i.e., organizing an educational, hands-on community engagement process enabling them to promote collaboration across all neighborhoods in the community. The community manual is organized according to the four strategies to guide inclusive and equitable planning with ample user-friendly graphic illustrations, some of which were created by middle and high school students with the help of our architecture students. The manual includes some of the plan maps described below.

4.4. Prototypical Plans

One of the primary outcomes of the mapping project is a set of design guidelines. Community leaders asked specifically for our team to propose plan maps for urban farms as a strategy for repurposing extensive areas of vacant land. Considering that the com-

munity consists of ten neighborhoods and vacant plots of land are scattered throughout all the neighborhoods and along commericial corridors, we decided to develop a series of protopical guiding maps that would be suitable for various urban farm types at varying urban scales, including blocks, districts, commercial corridors, and land-use zones. In consultation with planners from the City of Detroit Planning Department and local urban farmers, our students developed typological maps. Physical development in the community has remained dormant since 2020 as a result of COVID-19, but the community actors plan to implement some of our proposals in the near future in collaboration with a landscape architect. An example of the proposed plan map is provided below (Figure 14).

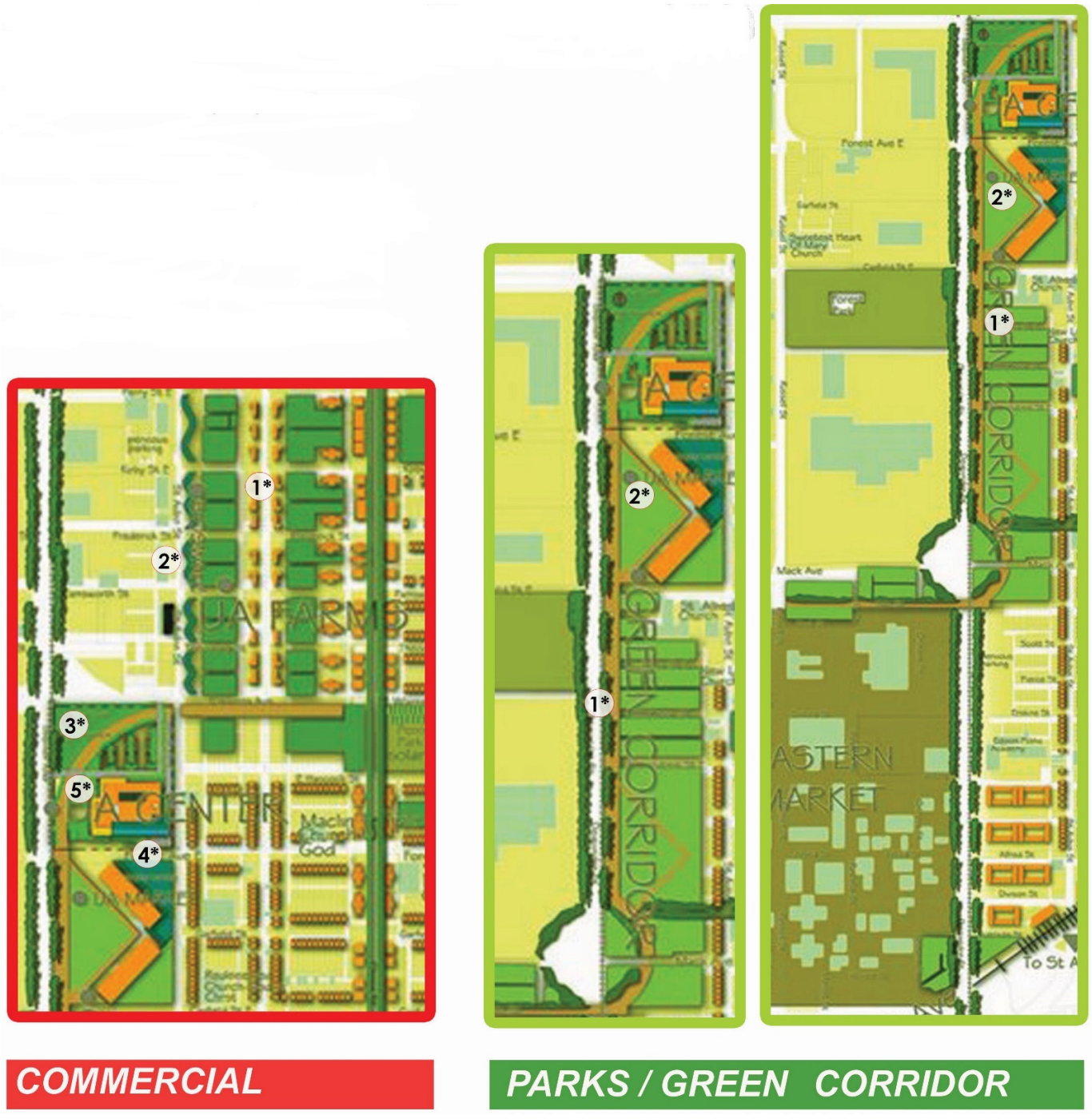

Figure 14. An example of a plan map for urban farm types.

Both the community manual and typological plan maps for urban farms are specific examples of planning and design guidelines that were produced by the mapping project in response to the community's request for help in encouraging engagement with their own community and with their effort to revitalize vacant land.

5. Impact of MMSs

5.1. Analytic Framework

Earlier, we raised the following question that guided our study: "Can architecture be made more relevant to underserved communities?" To address this question, we used mapping. Based on the request and a decision made by our study community, we conducted a hands-on, practical, participatory mapping project to support their community engagement efforts. With the aid of the mapping approach, the community leaders wanted to achieve several objectives: to provide middle/high school students with hands-on experience with mapping and planning, to assist residents with identifying community assets to leverage, and to encourage all neighborhoods within the community to collaborate on future development opportunities.

To examine whether the mapping project was deemed relevant to the study community, we used two constructs as analytical frameworks: social justice and social infrastructure. In the above literature review, we discussed the four elements of social justice (relevance, equity, governance, and participatory engagement). It was hypothesized that a planning process that is locally grounded, equitable, democratic, and participatory is likely to foster more socially just community development [34]. The social justice framework can be used to assess the relevance or appropriateness of planning efforts for a target community's unique local context.

The social infrastructure construct can be used as an analytic framework to examine whether a planning process fosters a sense of community and collaboration between members or groups of a given community and beyond. Social infrastructure is essential to promoting a sense of belonging and social cohesion, and these outcomes can lead to constructive activities, including social support, community participation, and collective action [35]. These are among the desirable social behaviors that community leaders would like to advance when facing challenges. Subsequently, the leaders asked our studio to organize the mapping project in ways that would assist them with their effort. The social infrastructure framework is based on lessons drawn from the interdisciplinary literature, and it is, for our study purposes, useful for examining whether the mapping project has helped the community achieve its educational and social goals.

5.2. Social Justice Impact

To examine the impact of the mapping project, we applied the social justice framework based on the operationalization of the four elements of social justice. Accordingly, we posed the following survey questions to community residents and other project participants:

Relevance: Is the project (mapping project or MMS) appropriate for the local context and does it address local needs?

Equity: Did the project encourage participation by diverse groups of people in the community?

Governance: Did the project allow residents to play key roles in decision-making?

Participatory engagement: Was the project participatory, engaging, and interactive?

Forty residents participated in the surveys before and after the mapping project (which was paused because of COVID-19). The surveys used Likert scales (with 5 signifying 'strongly agree' and 1 signifying 'strongly disagree'). Given the small sample size, we used descriptive statistics and the results indicated that more participants strongly agree or agree that Relevance (81%) and Participatory Engagement (85%) are more important than Equity (76%) and Governance (73%). Follow-up interviews suggest that the lower numbers for the latter values might be attributable to the leadership styles of some of the resident group leaders.

5.3. Social Infrastructure Impact

To examine the impact of social infrastructure, our analytic framework adopted three approaches to establishing social infrastructure—bonding, bridging, and leveraging—informed by the works of Domínguez and Arford [36], Claridge [37], and others.

We operationalized the three elements as explained below to conduct the resident surveys. Note that, to address the community leaders' abovementioned goals, we differentiated between neighborhoods and community, as there are ten neighborhoods in the study community.

Bonding: Did the mapping project encourage you to engage with residents in your block for any neighborhood affairs?

Bridging: Did the project encourage you to engage with residents in any other neighborhoods for larger community affairs?

Leveraging: Did the project encourage you or others in the larger community to engage with any external parties or groups outside the community?

According to the survey results, more participants strongly agree or agree that the elements Bonding (67%) and Bridging (62%) rather than that of leveraging (44%) produce the desired effects. Social infrastructure received a lower score than social justice. This may be attributed to the impact of COVID-19 and lockdowns between spring 2020 and early 2022. According to the follow-up interviews, however, some respondents reported a positive impact of the mapping project on residents and children, as we observe below.

What is the impact of MMSs on local children and other residents? Studying their experiences is important, but deciding how to measure those experiences (especially children's experiences) is challenging, especially during the COVID-19 pandemic (i.e., an external factor that could influence their responses to our interview questions). Nevertheless, we conducted 12 limited interviews during the pandemic. We summarized the results of the interviews using three key themes that ran through the interview results. Those themes were observed in both the interview results and those of a small survey (n = 40) we conducted, although the latter included additional information (e.g., the strength of the community's desire to start the next phase of MMS and MBP). We use the interview data primarily in this section, as the interviewees' direct quotes are more compelling in supporting the three themes.

An overview of the interview outcomes suggests that, during the post-MMS project time period and the aftermath, residents appeared to promote various types of engagement such as bonding, bridging, and leveraging. We also used interdisciplinary literature to support the interview findings.

5.3.1. Bonding

Bonding is defined as fostering a sense of belonging to one's neighborhood [36]. Detroit West consists of several neighborhoods, each with its own unique physical characteristics (e.g., land use).

One resident, a community organizer, stated that:

The mapping project allowed people in my block to share their oral histories passed down from the previous generations with my mapping research team. Our effort to discover such stories or lived experience of long-time residents has continued in some blocks, through small gatherings like block parties. These kinds of social encounters promote a sense of belonging and celebrate shared experience of our neighborhood, in both the present and past.

5.3.2. Bridging

Bridging involves associations that connect communities, groups, or organizations [37]. Similarly, bridging is likely to promote collaboration among neighborhoods within Detroit West. Some of the mapping tasks required participants from separate neighborhoods to collaborate on comparing land-use types or exploring how parks or vacant land across neighborhoods could be connected to create sustainable MBPs.

A high school student in one of the mapping research teams commented that:

My friend and I, along with my parents, worked with some kids in different neighborhoods. We talked about bike lanes and how to move a mapping station from parks in my neighborhood to other neighborhoods and how to create multi-purpose bike parks [MBPs] in different areas, and connect them. We met after school a few times and brainstormed about things like how to use maps and the mobile mapping station to improve our blocks, and how to use the mapping station to make it easier for people to access MBPs in different neighborhoods or in different parts of the community.

5.3.3. Leveraging

Leveraging involves partnering with an entity outside one's own community [36]: building partnerships with groups beyond the community. Forging a collaborative working relationship with external groups outside one's community is vital to sustainable growth and prosperity. While our mapping project's target community is Detroit West, we brought in external experts (architects, urban planners, city officials) frequently to critique the MMS and MBP projects, to broaden our perspectives and those of residents and other participants, and to examine the validity of our project and its impact against the backdrop of the larger context (e.g., Detroit as a whole).

A resident and local community development agency leader who participated in the mapping project stated that:

The mapping project helped me re-discover our community and its assets, but also to shine light on the areas where our community needs to partner with external entities such as the city government, major philanthropic foundations, corporations, hospitals, or universities. These organizations and our community have common interests. Some of our community organizations have reached out to city agencies, a major hospital, and a university to explore opportunities for collaboration such as job creation, community benefit agreements, sustainable community design, and multi-purpose bike parks.

In summary, while bonding, bridging, and leveraging overlap to some extent, each offers unique social attributes and implications for social justice values [38]. Bonding brings people together and encourages resident participation. Through bonding, aided by participatory engagement, participants shared oral histories and lived experience that has helped shape their community identity.

Bridging and leveraging are similar, as both advance the forging of partnerships with others. The difference, however, is that the former focuses on partnerships between neighborhoods within the same community while the latter focuses on partnerships between the community and wider areas.

Governance and equity (two of the four social justice values) are relevant to bridging and leveraging, but equity may be more important for bridging because ensuring equitable access to essential places, services, and amenities requires bridging efforts (e.g., negotiating, sharing, co-managing) between distinct neighborhoods within the larger community.

In contrast, governance pertains more particularly to leveraging because it is better suited to addressing power imbalances in the larger community, in the city, or in the region by ensuring equitable access to essential services and opportunities. Through negotiation, inclusionary practice, and upholding of the legal, social, and political rights of the community, a democratic, equitable governing mechanism can be promoted; this will require leveraging a broad range of influential groups outside one's community.

6. Conclusions

Taken together, our interview findings suggest that some of the participants continued to engage in bonding, bridging, and leveraging after the mapping project was paused. This activity indicates the potential for the mapping project to have a positive social impact. The study outcome suggests that architecture can be made more specifically relevant to underserved communities. The outcome, however, does not necessarily validate the idea that an architectural intervention such as the MMS project can make

architecture more relevant. Our study is limited by its scope, with a small sample size for the interviews, and its qualitative nature. To address these limitations, the author employed surveys, observer triangulation, data triangulation, prolonged engagement, the preserving of an audit trail, peer debriefing, corroborative member-checking, and thick descriptions [39,40].

While acknowledging the abovementioned limitations, we feel that the mapping project effectively illustrates a collaborative effort that could bring about greater equity and inclusiveness in planning, design, and community development, thereby building trust between residents and outsiders and developing a constructive working relationship with the community. This study also contributes to interdisciplinary research by exploring the link between mapping, architecture, social justice values, and community development as well as the link between academia and local communities through participatory engagement.

Several lessons gleaned from the study are worth noting here. The narrative and reflective nature of mapping is beneficial to underserved communities in their pursuit of self-discovery as well as to their re-examination of local conditions and social infrastructure via collective action, solidarity, and agency. An ideal mapping outcome is one that can also help to create social capital through bonding, bridging, and leveraging. Mapping alone, however, cannot adequately address the broader disparities facing underserved communities. To accomplish that end would require an integrative framework that includes upholding the four social justice values (relevance, equity, governance, and participatory engagement). The framework also requires mapping to be aligned with an inclusive and equitable planning and community development effort; this work consists of socially responsive strategies: inversion (reversing the conventional development process), reciprocity (switching roles), simulation (bottom-up experimentation), and research-in-action (just-in-time, tactical research).

This theory-building article explored this integrative framework through the application and examination of a mobile mapping station (MMS) project. The MMS project educated middle and high school students in the community about the benefits of mapping as a means of discovering community assets and incorporating them into community rebuilding. Through our discussion of a practical, hands-on, participatory MMS project, this article illustrates how an integrative framework could make architecture more accessible to broader populations. By integrating the various functions of mapping, the four social justice values, and the four strategies of socially engaged planning and community development, we demonstrated how such an integrative framework could make architecture more effective in serving the needs of underserved communities.

The limitations, lessons, and takeaways suggested above also indicate areas meriting further research, thereby advancing the interdisciplinary literature in inclusive architecture, democratic design, and socially engaged practice.

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