Engaging Communities in Developing Technologies to Support Community Flourishing: A Workshop Report

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Abstract. The *Engaging Communities in Developing Technologies to Support Community Flourishing* workshop was held in response to the NSF CRISES program call. The workshop explored integrating methods from community-based participatory research (CBPR) and computational social science (CSS) to advance social science research surrounding barriers to community flourishing with a focus on how emerging technologies should be designed and engaged. In this paper, we provide a brief report of the workshop and preliminary outcomes related to a roadmap for integrating CBPR and CSS approaches. We end with a call to the CSSSA community to intentionally move toward incorporating best practices from CBPR where appropriate to advance the value and impact of research on social issues affecting communities.

Keywords: Community-based participatory research, workshop report

1 Introduction

In early 2023 the National Science Foundation (NSF) released a Dear Colleague Letter (NSF 23-102) announcing the new Centers for Research and Innovation in Science, the Environment and Society (CRISES) program and posting a call for conference and planning proposals. Led by the Social, Behavioral and Economic Science Directorate (SBE), this new program seeks to fund centers that "will catalyze new research and research-based innovations to address seemingly intractable problems that confront our society" and "develop evidence-based solutions that address fundamental quality-of-life issues, such as those involving the environment, extreme weather and sustainability; workforce and the economy; equity and access to opportunities; and well-being" [1]. A multidisciplinary Lehigh University team responded to this call with a workshop on *Engaging Communities in Developing Technologies to Support Community Flourishing.* The workshop was premised on the idea that the integration of community-based participatory research (CBPR) and computational social science (CSS) forms a powerful foundation for building understanding of community needs and projecting outcomes that will guide successful development of technologies to address specific societal crises. In this conference paper, we provide a

background for this premise, a brief report of the workshop approach and experience, an initial summary of outcomes of the workshop, and a call to the CSSSA community to further explore the intersection of CBPR and CSS as a model for strengthening the impact and value of CSS research.

1.1 Background

CBPR and CSS are complementary methodologies used in human-centered sciences. Some social problems are intractable due to their complexity, persistence, and the interplay of various factors that make them difficult to solve. CBPR and CSS create a powerful synergy to address these challenges. At their core, these two approaches address complementary questions. CBPR asks, "What can we learn from a community that we can't learn from their data?" CSS asks, "What can we learn from their data that we can't learn from a community?" At the intersection of the answers to these two questions, there lies the potential to catalyze social science research aimed at addressing complex, dynamic challenges to community flourishing. By integrating CBPR's community-driven approach with CSS's computational analysis capabilities, researchers and community members can develop more effective, contextually relevant, and sustainable solutions to complex social problems.

Community-based Participatory Research. At the heart of CBPR is collaboration and equity between community members with lived expertise and researchers with learned expertise to build knowledge that contributes to positive social action for the benefit of communities. A CBPR framework acts as a guide to participatory, democratic research that seeks to "bring together action and reflection, theory, and practice, in participation with others, in the pursuit of practical solutions to issues of pressing concern to people, and more generally the flourishing of individual persons and their communities" [2]. While there is a spectrum of participation in community-based research, a robust CBPR approach requires more than engagement and includes co-development of project goals, research questions, methods of data collection and the dissemination of findings in a process that considers all members as equal partners from start to finish. Rather than having research done *to* communities, research is done *with* and *by* communities, which allows for in-depth analysis and a focused understanding of critical social issues in real time. Israel and colleagues [3] explain it as an "empowering, co-learning process" through which participants can increase control or sovereignty over their lives. For this to happen, CBPR requires training, time and flexibility, shared resources and shared control. Paramount to CBPR is the practice of cultural humility, which requires researchers not only to confront their own bias but to investigate and confront the roots of bias, discrimination and inequality that shape the lived experiences of the partnered community. In doing so, research becomes a collective effort and "emphasizes respect for the dignity and value of community experiences, cultures, and perspectives, building relationships based on mutuality and bidirectional learning" [4].

CBPR can guide projects of all designs and methods by deliberately confronting the traditional power imbalance and barriers between communities and academia. In bringing together community and scholarly expertise and resources, research and impact are strengthened. However, to be done well this work requires a deep understanding and rigorous application of the core principles (flexibility, reciprocity, equity, shared control, cultural humility). CBPR continues to gain widespread support and has been adopted by many research foundations as a key component for funding. There is a need to train researchers and community members and to strategize and integrate this approach across the sciences. CBPR offers the tools to build trust and reciprocity, while uncovering critical questions and answers that can "help build the requisite collective capacity among residents-at-risk, [community-based organizations] CBOs, public health agencies, policy makers and scientists to respond to priority problems with strategic, cost-effective and sustainable changes in policies and practices" [5].

Computational Social Science. CSS is an interdisciplinary field that uses computational approaches to study social phenomena. It integrates techniques from computer science, statistics, and social sciences to analyze large-scale datasets and understand complex social systems [6]. It enables social scientists to accomplish three broad tasks: analyze, model, and simulate. First, these tools analyze data at scale, such as text data, real-time traffic data, social media posts, and digital trace data. Working with millions (or even billions) of observations requires immense computational power to organize, clean, and merge to structure relevant information, but it also pushes researchers to look beyond quantitative techniques developed for traditional surveys [7]. With large-scale multi-format data, we gain insight into rare processes, fine-grained heterogeneity, and small but significant differences [8]. Second, these tools enable researchers to model human societies and communities as complex social systems [9]. While traditional mathematical models are typically used to understand relations between variables, computational models are used to understand interactions between system components [10]. System components include individual decision makers and geospatial environments. Finally, these tools enable researchers to simulate interactions among these components to generate larger social patterns, some of which persist as difficult social problems, and to identify leverage points to alter the system's equilibrium [11]. CSS tools allow simulating interventions in a community-specific synthetic population, providing insights into the effectiveness of interventions and the optimal sequences for implementing them within specific communities to achieve planned changes [12]. Traditional methods are less effective under deep uncertainty as they rely on their ability to predict the future based on past data. However, CSS simulations help researchers deal with deep uncertainty, generate possible future scenarios, and provide quantitative support for various interventions.

While powerful, CSS is not without weaknesses. Data and system rules may lack construct or face validity. Many constructs may attempt to capture unsettled, or even openly contested, meanings (e.g., "efficiency" at a national versus household level.) Researchers may privilege large-scale data that is easy to obtain (e.g., social media posts) or system rules that are developed in different populations over smaller-scale difficult to obtain data or system rules that make sense among local community mem-

bers (e.g., community interviews), which may be more relevant for a given question. Lastly, CSS must always grapple with ethical questions that arise when using data that were not generated for research purposes.

Emerging Technologies. Over the past few decades, there have been waves of excitement about social progress that could be precipitated by new technologies. Mobile phones might enable impoverished rural populations to complete microtasks that earn them relatively significant income [13]. Students given individual computing devices can learn not only subject matter more effectively but even learn to program the computer itself (e.g., the One Laptop Per Child initiative). Use of predictive algorithms could reduce individual judges' sentencing bias [14]. These are just a few examples of the rhetoric and visions around the use of technology to address societal crises.

At the same time, such excitement has often been tempered by limited actual results. Users of mobile phones or internet cafes have seen relatively little of the imagined economic benefits [15]. Simply providing access to technology rarely provides significant educational benefits, and when those benefits occur, they are not equitably distributed [16]. Instead, students in programs that provide them their own computing device spend less of their time learning to program the computer and more time watching videos for entertainment [17]. Despite the appeals to objectivity, algorithmic risk assessments in criminal justice often end up perpetuating and even exacerbating years of systemic racism [18]. Put concisely, despite the best intentions, attempts to address societal challenges using technology often fail, sometimes spectacularly so.

One emerging strategy aimed at addressing these failures involves participatory approaches. Examples range from designing optimization systems for distributing food bank resources in an equitable manner [19], to computational uses of case notes in the child welfare system [20,21]. Such work explicitly pushes back against seeing the technologist as a liberator, acknowledging that engineering, computer science, and related disciplines do not have the solutions to every problem. Instead, they must both leverage social scientific principles and work closely with community partners to design ethical, socially just technologies. Put differently, this emerging approach means valuing the strengths of communities that have been harmed by marginalization and designing *with*, not *for*, those who have direct knowledge of local needs and solutions.

1.2 Vision: Integration as a Roadmap for Innovation

Combining the CBPR and CSS approaches promises to form a strong methodological foundation capable of catalyzing new research innovation through integration of research techniques with complementary strengths. We envision an outcome where the whole is larger than the sum of its parts, with the converging approaches providing new pathways to social science innovation. In the workshop described below, we focus this combined research and data analytic approach on consideration of the development of emerging technologies. This focus may provide the opportunity for powerful, community-engaged social science research to address societal crises in a profound and longer-lasting way, because of the capability of these technologies to provide continued support within communities beyond individual research efforts.

While the workshop described below focused on emerging technologies in particular, we believe the approach of combining CBPR and CSS methodologies should have widespread appeal and can lead to transformative impact across the social sciences.

2 Workshop Overview

The *Engaging Communities in Developing Technologies to Support Community Flourishing* workshop was held in Bethlehem, PA May 21 - 23, 2024. Against the iconic backdrop of the Bethlehem Steel blast furnaces, attendees at the three-day workshop shared knowledge and built community through presentations, panels, and guided activities.

2.1 Workshop goals

The goals of the workshop included:

- Providing a forum for researchers to explore the benefits and challenges of combining CBPR and CSS methodologies to strengthen scientific inquiry into societal and environmental crises.
- Drafting a roadmap for how to integrate CBPR and CSS to advance research-based innovations in technology designed to address social crises that diminish community flourishing.
- Developing a set of pilot project outlines centered around specific areas of societal need that represent a test drive for a combined CBPR and CSS approach.

2.2 Attendees

The 36 individuals who participated across the three-day workshop brought complementary knowledge, skill sets, and lived experiences. Approximately two thirds of the attendees were researchers with academic or private foundation affiliations; while, the remaining third of the attendees were community partners with non-profit or government affiliations who engage in direct efforts to affect community change through programs and policy. All participants held a common drive to explore and develop the landscape of evidence-based solutions to profound societal crises.

2.3 Themes and Activities

Drawing directly from the CRISES program's Dear Colleague Letter (NSF 23-102), three themes for the workshop were inspired by the statement, "*Innovations in the human-centered sciences–those focusing on people–can improve well-being and our ability to thrive.*" The three themes were: *Human-centered*; *Scientific Innovation*; and *Improved Well-being*. Within each of these themes, attendees addressed questions designed to prompt deep consideration of the challenges associated with interdisciplinary and translational research. Grounding the activities of the workshop with these

three themes provided the opportunity to consider the differences and similarities in the ways that attendees from different disciplines and sectors considered core questions arising from these themes.

The workshop activities served to support knowledge sharing and community building across the attendees from various sectors and research fields. Knowledge sharing occurred through 1) tutorials on CBPR, CSS, and emerging technologies that provided a common language for workshop attendees from vastly different backgrounds; 2) a panel discussion from community partners describing the areas of community flourishing that they address in their work and activism; and 3) research talks from a variety of disciplinary and interdisciplinary approaches. Building on these foundations, deeper knowledge integration arose during small, interdisciplinary working group activities designed to develop the outcomes of the workshop. Community building arose during guided dialog and activities that supported sharing of personal and research stories, and was further deepened by activities that focused on planning for future engagement.

2.4 Workshop Outcomes

Some workshop outcomes are indirect, arising from shifts in the ways that attendees approach research collaborations in their academic and community settings moving forward. These outcomes may be wide-reaching and seen in the impact that the experience has on individual participants' approaches to future research projects, and the success in establishing ongoing partnerships among workshop attendees. More direct outcomes of the workshop are found in two types of deliverables produced by attendees at the workshop. The interdisciplinary workshop attendees participated in guided working groups that 1) drafted a roadmap exploring the intersection of CBPR and CSS, and 2) outlined pilot projects for targeted societal crises that formed case studies for the workshop.

A roadmap should seek to provide guidance to those wishing to move in a new direction. As such, workshop attendees sought to establish common language, present anticipated challenges, and if appropriate, suggest approaches to confront those challenges, highlight expected benefits, and provide specific recommendations for individuals, research teams, and more broadly fields of study to move toward an integration of CBPR and CSS methodological approaches. Focusing on the topics of people, methods, and data, each working group designed a vision and addressed questions of strategy and metrics for successful integration of CBPR and CSS research approaches. Following the initial consideration of this integrated approach, the workshop attendees sought to apply this approach to brainstorming pilot projects based on three specific societal crises that served as case studies for the workshop: housing insecurity, agriculture and food security, and health literacy.

3 CBPR and CSS Integration: Preliminary considerations

As noted in the introduction, CBPR and CSS offer complementary strengths to develop effective, contextually relevant, and sustainable solutions to seemingly intractable social problems. CBPR addresses community relevance, local knowledge, and com-

munity empowerment. CSS provides advanced computational methods, large-scale data analysis, and modeling complex systems. Researchers, who are seeking to integrate CBPR and CSS approaches, should consider the following aspects of the integrated approach: 1) people engaged in and by the research, 2) methods selected and developed for community specific-crises, and 3) data generated by or used in the research.

3.1 People

Engaging in a combined CBPR and CSS research approach should lead to thinking about both *community as researchers* and *researchers in community*. The roles that individuals play within this approach must be defined and understood by all members in the collaboration. Aligning the experience and expectations of all individuals, researchers and community members, is needed to support successful partnerships.

- Community can be defined by many different dimensions: location, shared values or interests, social networks, etc. Alignment of these definitions of community between members of the community and researchers may be particularly important for CSS researchers who rely on available big data. Do the people defined by a collected set of data self-identify as part of the studied community?
- Communities are not homogenous. Diversity within a community should be examined and understood. Researchers should consider which individuals in the community are providing data and which are not. We propose adopting practices, such as power mapping [22], equity/racial justice lenses [23], and engagement strategies [24], which allow researchers to understand the context and ensure equal engagement.
- Different groups of people within a studied community may be impacted in different ways. We propose using a model such as the social-ecological model [25] to consider which groups occupy each level of the model to address who is making the changes and who is being impacted by the changes.

3.2 Methods

A methodology that combines CBPR and CSS approaches must have the flexibility to address converging research questions within the context of specific populations and samples of populations. Therefore, there is no “one-solution-fits-all” method that we propose, rather we suggest a non-traditional set of approaches tailored to a research agenda identified by a university-community partnership that positively impacts the local community.

- Combining CBPR and CSS makes available a variety of methodological tools, ranging from ethnography to computational modeling. We posit that these tools should be thought of as complementary and that they provide convergent and divergent signals that reflect the complexity of real-world data. More traditional methods should evolve to allow divergence to be an active focus of research and analysis, allowing research methods that capture both the nuances and the pattern.

- We also recognize that the different methodological approaches serve to answer research questions at different scales and levels, with different speeds and timelines. These methods require new approaches to training the next generation of researchers, who could be interdisciplinary researchers working in the overlapping space, or a team of researchers with deep appreciation of the other methodology and readiness to collaborate.
- CBPR often works with a specific community under constrained conditions, making it difficult to produce data that meets certain scientific requirements (e.g., having a control group to compare to). CSS is a complementary method that brings the ability to leverage existing data to provide control group comparison.
- CSS as a methodological approach is subject to the criticism of overfitting data to computational models [26]. CBPR helps guide such modeling by understanding what the community wants to predict and does not want to predict.

3.3 Data

Understanding data from a combined CBPR and CSS methodology requires an expansive approach to data, in which all data are valued and hierarchies of data are broken down. Research and community teams need to start with this inherently expansive view and work to explicitly define "high-quality" data within the context of a particular project. Put differently, the criteria for what constitute high-quality data are likely to vary from project to project, based on the constraints and the desiderata imposed by the relevant communities, by the researchers involved, and by other affected stakeholders. Data are always positional (from a place) and contextual (about a place), thus requiring a deep consideration of the data that is sensitive to characteristics of the community that generates the data.

- Data take many forms, even within a single project, when working with community derived research questions. Qualitative and quantitative data, big and small N, strategically collected and "found" data may all be brought to bear on community-driven research questions.
- Data, like the communities that they arise from, are messy. That said, community-based data are valuable not in spite of, but rather because of, this messiness. Understanding these data on their own terms, rather than attempting to force them into either traditional or emerging standards of data "quality" [27] is both non-trivial and key to appreciating these data as fully as possible. Thus, researchers bringing CSS data analysis approaches to CBPR generated data must embrace this messiness and develop strategies in advance to engage with, and indeed foreground, the messiness as meaningful information about a community.
- Consideration of data privacy, security, and ownership must take into account the context of the community that contributed the data. In this context, we must consider not only the data themselves but also what can be inferred from them. In particular, aggregations of data from a community have the potential of being used to make claims about a community with which community members themselves might not agree [28]. Working directly with community members, not on-

ly in terms of data collection but also in terms of analysis and interpretation, can help both reduce potential harms and increase community benefits.
- Emphasis on access to data by the community involved in the research is critical. Access not only means making data available to a community, but also fostering data literacy and statistical reasoning from an early age across all communities.

4 Call to the CSSSA Community to Engage CBPR Approaches

Engaging communities in all stages of research is not only the right way to do research, it is the better way to do research. Community engagement is a powerful tool for improving and expanding the impact of social science research.

4.1 Benefits of CBPR for the CSSSA Community

Engaging in CBPR can enhance the relevance and impact of research conducted by the CSSSA community. It improves data quality and contextual understanding, increases community trust, and fosters collaboration. Moreover, it helps develop interventions that are both sustainable and effective, ensuring that solutions are tailored to the specific needs of communities.

4.2 Possible Practical Steps for Engaging in CBPR

To effectively integrate CBPR with CSS, building strong, trusting partnerships with communities is essential. This process begins with identifying key community members, organizations, and leaders whose direct experience provides insight into the social issues your research addresses. Approaching these stakeholders respectfully, acknowledging their expertise and experience, and engaging in open dialogue to understand their perspectives, needs, and concerns are essential steps. Open-mindedness is critical at this stage as you consider that your a priori research questions may not align with the questions that community members raise to the same issue. Embrace the opportunity that these new questions may have to strengthen your own understanding.

As connections and trust are established, and continually renewed, collaboratively setting clear goals and expectations for the research project ensures that all team members, both researchers and community partners, understand the benefits and responsibilities of their partnership. Where appropriate there should be alignment in the objectives, but also deep awareness of where objectives may not fully align and how the research may serve diverse purposes, each with value. Explicitly defining the roles of community members and researchers, the scope of research, and the anticipated outcomes helps build a strong foundation for ongoing collaboration.

A successful CBPR approach requires active collaboration throughout the research process. Involving community members in the development of research questions and methodologies ensures that the research addresses relevant issues and respects the community's context and values. Practically speaking, it also increases the chances of successfully collecting quality data that can be interpreted in meaningful ways. Partic-

ipatory methods such as focus groups, workshops, and community meetings can be used to gather input and co-create the research design. Providing opportunities for community members to participate in data collection and analysis is also vital. This approach can include training community members as co-researchers, ensuring they have the skills and knowledge to contribute effectively, and receiving training from community members about the methods for data collection that will work within their community. Equitable involvement helps to build trust, enhances the external and internal validity of the data, and ensures that the community's voice is represented in the findings that are in turn brought back to the community.

Ethical considerations are centered in CBPR to protect the rights and well-being of community members. Being mindful of power dynamics between researchers and community members, and striving to create an inclusive environment is essential. It is also important to maintain transparency throughout the research process by regularly communicating with community members, sharing preliminary results and seeking feedback to ensure the research remains aligned with community needs. Accountability is achieved by honoring commitments, being responsive to community concerns, and ensuring that the research outcomes are accessible and beneficial to the community.

By building on these steps and continuing to study best practices in CBPR, the CSSSA community can expand to engage in CBPR approaches, leading to research that is not only scientifically innovative but also socially relevant and impactful.

4.3 Potential Barriers and Overcoming Strategies

Integrating CBPR with CSS presents several potential barriers that need to be addressed to ensure successful collaboration and impactful outcomes. Here we describe three potential barriers and strategies to overcome them.

The first potential barrier is the significant time and resource investment required for effective CBPR. Building trust and establishing meaningful partnership with community members are time-intensive processes that require continuous engagement and communication. Additionally, involving community members in the research design, data collection, and analysis phases can be resource-intensive, necessitating adequate funding and logistical support. To overcome these constraints, securing funding and institutional support is essential. Researchers should seek grants and financial aid specifically geared toward CBPR initiatives. Institutions can support these effects by providing administrative resources, facilitating collaborations, and recognizing the value of CBPR in tenure and promotion evaluations.

The second potential barrier is balancing scientific rigor with community needs, which can be challenging because these two aspects can sometimes have different priorities. Scientific rigor involves adhering to strict methodological standards to ensure the validity and reliability of research findings. This can include controlled experimental designs, precise data collection methods, and thorough data analysis. On the other hand, community needs emphasize practical relevance, immediacy, and cultural sensitivity. Communities may prioritize interventions that address urgent issues or align with their cultural practices, even if these interventions do not conform to standard scientific methodologies. To overcome these challenges, researchers can leverage existing CBPR frameworks and resources that provide guidelines on main-

taining scientific rigor while being responsive to community needs. These frameworks offer strategies for co-creating research questions, designing flexible methodologies, and ensuring that the research process remains transparent and inclusive.

The third potential barrier is fostering a culture of collaboration and mutual respect between researchers and community members. This process involves continuous dialogue, shared decision-making, and a commitment to addressing power imbalances. Power imbalance between community members and researchers arise from differences in knowledge, resources, authority, decision-making control, and historical contexts. Researchers typically possess specialized expertise, funding, and institutional support, while community members may lack these resources and often have limited input in research processes. Addressing these imbalances involve co-creating knowledge, building community capacity, sharing decision-making authority, maintaining transparency, and respecting community values. By implementing these strategies, the CSSSA community can harness the full potential of CBPR to tackle complex social issues, produce high-impact research, and drive meaningful change, while empowering communities.

4.4 Call to Action

The integration of CBPR and CSS presents a transformative approach to addressing complex social issues. Members of the CSSSA are uniquely positioned to lead this effort toward innovative integrative methodologies. Here is a call to action for CSSSA members to actively engage in CBPR approaches.

First, we encourage CSSSA members to consider the opportunities for CBPR approaches in their research. Where appropriate, involving community members as active partners benefits your research, ensuring that it addresses community-specific challenges and produces outcomes that foster community flushing.

Second, we highlight the many opportunities for training and capacity building that are available to support this integration. Various institutions and organizations offer workshops, courses, and resources designed to equip researchers with the skills necessary for effective CBPR. Additionally, CSSSA can facilitate access to these resources by organizing webinars, creating an online repository of CBPR materials, and partnering with institutions that specialize in CBPR training. On an individual level, partnering with researchers already deeply engaged in CBPR approaches to social science research can provide reciprocal training across methodological approaches that will expand the mutual benefits of a combined CBPR and CSS approach to social science research.

Third, we invite members to join collaborative initiatives and networks focused on CBPR, helping to create a future where complex social problems are tackled through combined computational and participatory methods. CSSSA can play a pivotal role in fostering connections by creating special interest groups, hosting education workshops, and facilitating collaborative research grants.

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