Community Conversations: A Model for Community-Driven Design of Learning Ecosystems with Geospatial Technologies

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Abstract: Geospatial technologies can be leveraged by community members to identify physical and social barriers to youth participation in out-of-school-time (OST) activities. In this paper, we describe Community Conversations, a case model of an intentionally designed sociotechnical system to support a community's redesign of their informal learning ecosystem. The model combines data and geospatial analysis with grassroots community engagement. Our approach supports a community-driven method for defining the vision of what an equitable OST learning ecosystem should look like. We share experiences with complex modeling of sociopolitical dynamics (often unrepresented in data mining and geospatial technologies) and reflect on our understanding of the "geographic expression" of socioeconomic inequities and injustices.

Introduction

Developing a healthy and robust learning ecosystem requires researchers and other stakeholders in ecosystem design to pay attention to and understand the relationships between both formal and informal learning (Pinkard, 2019; Gordon, Bridglall, & Meroe, 2005). High quality out-of-school time (OST) experiences can positively impact participation and learning. For STEM content areas, studies have shown this is particularly important for youth from lower-income communities (Falk, Storksdieck & Dierking, 2007). Given that OST is fundamental to youth development, it is critical that learning stakeholders have a holistic view of local learning opportunities across space and time, which includes (but is not limited to) afterschool programming, summer programs, church, sports, and tutoring. To gain a complete understanding of their local OST landscape, learning stakeholders can use technology to identify and address gaps in OST programming.

In this age of geospatial technologies, mapping mobility and participation (or lack thereof) across geographical space is easily possible. Technology allows us to digitally reveal barriers and challenges faced by minoritized youth groups to participate in enrichment programs, safe spaces, and other transformational OST learning experiences. While these technologies offer a new type of inquiry that is place-based and contextually rich, they only become powerful interventions if the narrative about the local OST landscape and the decision-making ability are both in the hands of the community. In this paper, we offer a case model that places the community at the center of the design process. Unlike design-based research processes that can privilege the researcher's perspective (Vakil, de Royston, Nasir, & Kirshner, 2016), we seek to understand how working with communities to design sociotechnical activities that leverage geospatial technologies can empower new understandings and strategies to advance equity-oriented learning goals. Accessibility constraints disproportionately affect impoverished communities and communities of color that still struggle with the legacy of state-sanctioned segregation, school closures, health disparities, and systematic disinvestment (Ewing, 2018; Riley, 2018). While access does not equate to equity, a goal for this work is to understand the nuanced dimensions of accessibility which are essential for making OST opportunities truly accessible to all youth and families. By understanding the dimensions of access, we can better design an OST ecosystem that is equitable not only in the spatial distribution of OST programs but also in program participation across communities, races, income levels, gender, and other identities. In the sections below, we outline Community Conversations—a case model that addresses the following primary questions: (1) What types of social practices does the community engage to advocate for equity in the wider learning ecosystem? (2) What types of resources and sociotechnical tools do community leaders need to facilitate those social practices and conversations?

Theoretical approach

A learning ecosystem centers the learner in a dynamic network of people, resources, and institutions (Barron, 2006; Brofenbrenner, 1979). Often, those who seek to improve learning at a systems-level focus on scaling successful interventions within and across communities (Fishman, Penuel, Allen, Cheng & Sabelli, 2013). Less

prolific is learning research and design that integrate geospatial analytics, sociocultural theory, and community-based design research. We aim to model how a community's geography serves as a map for understanding inequity. One example is how the allocation of learning infrastructure (i.e. schools, parks, libraries) contours diversity in OST opportunities (e.g. programs, camps, events, etc.). In the case model described in this paper, we use intentionally designed data structures to capture metrics about OST opportunities that are relevant to visioning and assessing a learning ecosystem, such as location, capacity, content area, and provider. These factors map onto what we know about assets in a child's learning ecology (e.g. people, spaces, breadth, and depth of content) and barriers to participation (e.g. cost, proximity, feeling out of place). In this model, the vision for what equity should look like and how we collaboratively design for equity (i.e. how the geospatial representations and other visualizations are interpreted) is driven by the community. This grassroots approach to research is not novel. However, the special combination of data visualizations and geospatial technologies to aid community advocacy warrants new opportunities for meaning making and forms of interaction between community members and research teams. Below, we highlight a process to engage members in Community Conversations that leverage geospatial technologies in the design of healthy and equitable learning ecosystems.

Community-based sociotechnical model for design and research

The case model has three primary components (see Figure 1). The first is the research and design collaboration leveraging the sociotechnical system. The second is new and revised practices that emerge from the collaboration, with the potential to change the community learning infrastructure. The third is the impact on youth participation, learning and development.

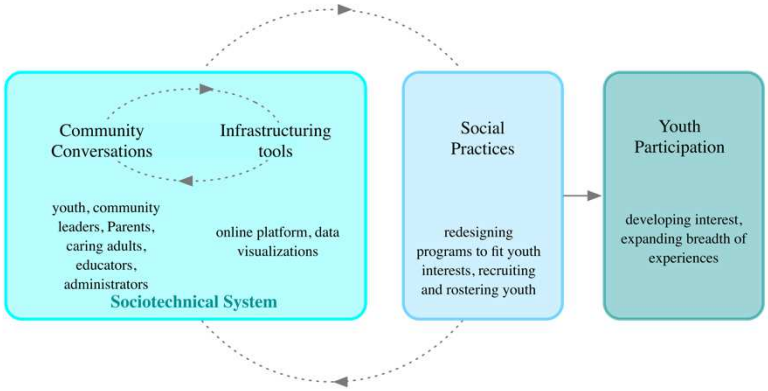

Figure 1. Community-based sociotechnical model for design and research.

The purpose of Community Conversations (CC) is to form a community partnership that is engaged in making decisions about how, where, and what youth opportunities (should) happen during OST. CC should typically take place in a space that is easily accessible to community stakeholders and last approximately 2-3 hours. Potential stakeholders include teachers, parents, violence prevention workers (VPW), informal learning providers, community agencies, youth, and the research team. CC should provide critical information to the research team that creates and updates maps and data repositories with context-related information gleaned from discussion. These updated maps are intended to help community members understand and narrate their OST landscape as well as make evidence-based demands to the city and other funders on how to improve the OST landscape. The Infrastructuring Tools consist of an online OST learning platform and community maps that show the abundance and variety of programs and available community assets. The community maps also highlight the potential barriers to participation and access. For example, lack of safe passage due to over-policing or gang territory. The community assets data originates from training community members to use geographic information systems (GIS) tools to document community assets, including potential or existing OST learning spaces (e.g. parks, libraries, schools, community centers), places with valuable resources (e.g. computer labs, 3D printers, instructional kitchens), and organizations providing programming for youth. CC and the Infrastructuring Tools make up a sociotechnical system that seeks to make a community's learning ecosystem both visible and actionable in order to empower more equitable participation and engagement. The resulting sociotechnical system results in adapted social practices. Social practices refer to the interactions, routines, and practices that inhibit and facilitate youth's participation in OST programs. As the learning ecosystem evolves, social practices will include redesigning programs to fit youth interests, recruiting and rostering youth for OST programs, and brokering opportunities and partnerships to facilitate youth mobility and development. Together these components should

lead to increased youth participation, seen through an expansion in the breadth of experiences available to youth, defined focal pathways for youth development and ultimately, youth's deepened interest in and passion for their chosen activity.

Stages of the design process

The design process has three primary stages but is cyclical in nature. Each cycle points to new implications and decisions and generates new community maps that can be reinterpreted.

Stage 1: Community maps

In stage 1, the research team creates data visualizations that summarize the communities' demographics and baseline OST ecosystem. Examples of public datasets include US Census data, the American Community Survey, and data from the city data portal. Specifically, we have used these datasets to look at community level unemployment, disposable income, household income, race, education level, youth density, childcare spending, car ownership, household size, and crime. Examples of OST data are from the Chicago City of Learning database including program locations, providing organizations and location types, programming content areas, and target ages.

Stage 2: Preparation for community conversation

In stage 2, on-the-ground data is used to supplement baseline data. For example, the research team can share crime hot spot maps with violence prevention workers (VPWs) and then update and edit the map to reflect their insights. Residents, program providers, and VPWs can host a tour of the neighborhood to collect pictorial evidence and share stories that reflect the experiential and infrastructural factors that impact walkability. Youth surveyors can collect information about programs and building facilities that did not or could not serve youth during OST and create community inventories. All of these sources of community knowledge should be added to community maps to reveal the true experience of youth OST participation. The maps (Figure 2) give an example of a community's walkability to learning spaces. The complexity of walkability is challenging to represent, and our model is informed by existing data and computational algorithms, as well as people who live in the community. Walkability is represented by a shape indicating distances within a 10-minute walk from the latitude and longitude of a location of interest. The walkability shapes incorporate barriers such as busy streets and difficult to access routes (informed by a resident), accounting for the uneven shapes). These locations and walkability reach shapes are layered over a heatmap of crimes committed in public areas (data extracted from the Chicago Police Department's Citizen Law Enforcement Analysis and Reporting system from the city's public data portal).

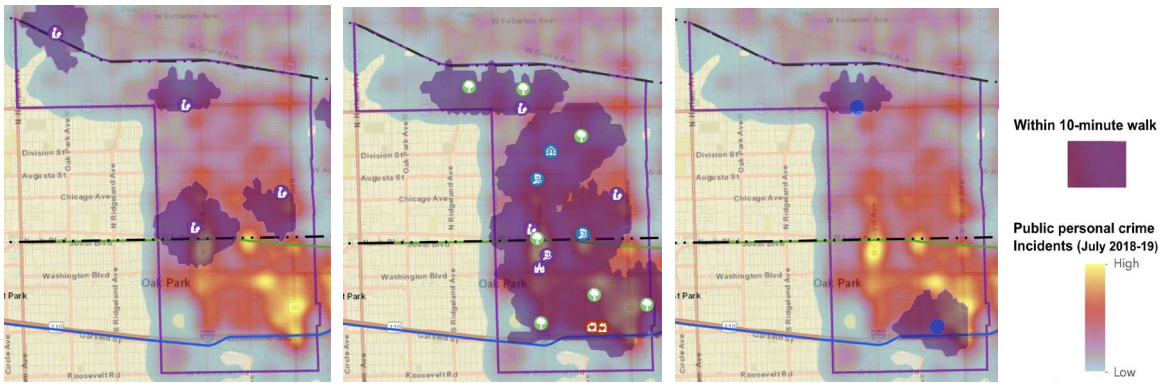

Figure 2. Walkability to (a) public libraries, (b) summer programming, and (c) middle school coding programs.

Stage 3: Community Conversation

In stage 3, the community partner hosts a CC in a safe and welcoming space. The meeting is catered by a local business. The research team shares data visualizations and maps updated with community insights. All attendees are asked to reflect on and respond to visual artifacts. Community members are asked whether and how their experiences support, contradict, or provide nuance to the data, and what additional data and visualizations could inform community decisions regarding their OST ecosystem. In our pilot study, community members highlighted the lack of coding programs for middle school youth and the need to coordinate programming and transportation to take into account increased vulnerability when the sun sets. Members also expounded the notion of safety – that safety for youth of color also means being accepted and welcomed in spaces. While the community partner determines the agenda and leads the workshop, the research team listens and asks probing questions to understand

social and technical implications for design (e.g. what data should be collected, how data visualizations should change, what relationships or partnerships should be fostered). The team intentionally allows space and time to nurture relationships with community stakeholders and foster collaboration.

Implications and future work

Our intention is to use this case model to create a robust evidence-based design framework that leverages geospatial technologies as an instrument for community engagement and advocacy. Our work adds nuance to discussions about access. We use GIS technologies to see the ways in which the built environment (ex. buildings, roads, alleys, open lots, green spaces) and the social environment (ex. racial segregation, community disinvestment) conspire to reproduce socioeconomic disparities and inequities (Hogrebe & Tate, 2012). We join forces with community members already engaged in equity and social justice work to center the voice and vision of the community. As a research approach, this combination of CCs and geospatial analytics will enable complex modeling of sociopolitical dynamics. Recognizing that geospatial technologies do not normally represent experiential data, our combination of ethnography and GIS is new to the field. This case model offers an approach to understand and remediate the "geographic expression" of socioeconomic inequities and injustices (Hogrebe & Tate, 2012, p.67). GIS technologies like Google Maps will continue to influence the ways in which people everywhere navigate the world. It is incumbent on us to understand how to use these technologies to pave more just and equitable pathways for our youth.

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