IMPROVING COMMUNITY WALKABILITY THROUGH UNIVERSITY OUTREACH, TECHNOLOGY AND CROWDSOURCING

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1 ABSTRACT

Improving community walkability requires an understanding of existing infrastructure and user perception and behavior, as well as expertise in physical design. Because local leaders often lack access to this type of information, a University Extension Outreach program for small communities was developed that reframes expert assessment as a community-learning experience using digital technology, user perceptions, facilitated evaluation, and infrastructure data collection.

The methods implemented identified user perceptions of assets, barriers, and opportunities for improving walkability (and bikeability) and documented how walkers and cyclists interact with the environment. Using local experience as a foundation for participatory planning, these methods allowed residents to make meaningful discovery about community infrastructure, while the hard evidence generated in the facilitated infrastructure assessments reinforced decisions about the investment of scarce funds.

This crowdsourcing method is beneficial beyond the raw data. For instance, inviting citizens and civic leaders to experience infrastructure conditions firsthand through assessing the community's transportation network and discussing issues they discovered strengthens the local walkability coalition.

This paper presents the methodology employed in more than 50 Iowa communities to collect user perceptions, evaluate the current infrastructure, and present that information in a format appropriate for both local leaders and the general public. Through this participatory research process, local leaders were able to make informed decisions regarding changes necessary to improve walkability (and bikeablility) in their community.

1.1 Keywords

Walkability, crowdsourcing, outreach, participatory research, and technology

2 INTRODUCTION

The correlation between the decrease in physical activity and the increase in the number of children (and adults) who are overweight or obese over the past decade is well documented (Heelan, Combs, Abbey, Burger, & Bartee, 2013; Frank, Andresen & Schmid, 2004; French, Story & Jeffrey, 2001). Currently, one in three children in America is overweight or obese. The state of Iowa is no exception to this trend, with 28.3% of children ages 10–17 overweight or obese (NSCH 2011). In 2010, the Iowa Department of Public Health and Iowa State University (ISU) Extension and Outreach worked together to address the childhood obesity problem by creating the Iowans Walking Assessment Logistics Kit (I-WALK).

I-WALK is a participatory program and relies on local knowledge of the day-to-day transportation issues. The program is innovative in its use of both crowdsourcing and geospatial technologies. This paper documents the main program elements and identifies benefits generated from the participatory process conducted at 57 locations across the state of Iowa (Figure 1). The primary goal of the program is to develop a sustainable participatory model that not only aids in the building of community coalitions but also provides a process in which those coalitions can continuously update, visualize, evaluate, and implement local Safe Routes to School (SRTS) plans.

Recognizing the importance of promoting healthy behaviors for all Iowans and that older residents face issues similar to youth, the I-WALK program expanded in 2013 to include transportation issues impacting older Iowans. Health data from 2014 rank Iowa as 16th highest for adult obesity. Today, nearly 31% of Iowa's adult population is obese—a more than 19% increase since 1990 (State of Obesity, 2015).

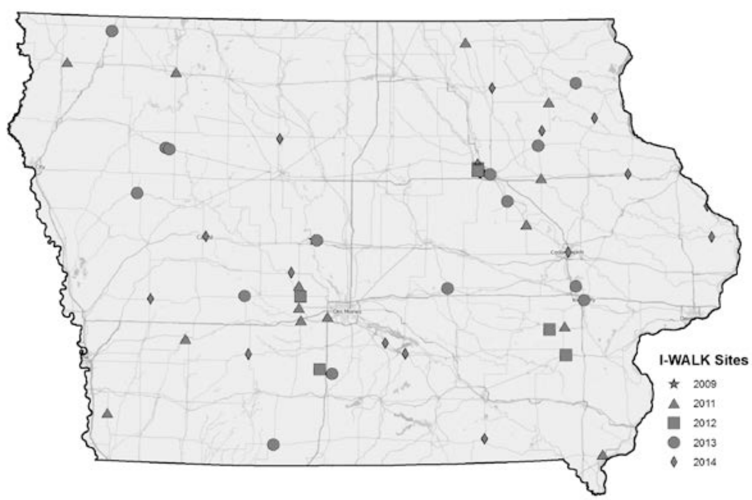

Figure 1. I-WALK has been successfully conducted as 13 adult and 44 SRTS projects across Iowa.

3 METHODOLOGY

Both the youth and older-adult I-WALK programs utilize f-VGI to collect several of the data sets necessary for the coalition and planners to visualize and identify potential infrastructure improvements. Two main components—the first of which is a geospatial survey to collect user statistics and perceptions—provide this information. Following the survey, the second component —a mapping workshop — allows volunteers to use GPS-enabled smartphones to map pedestrian infrastructure throughout the community. These two components include five key participatory elements as part of the program methodology: 1) perceived behavioral issues, 2) inventory of routes walked, 3) identification of improvement opportunities, 4) infrastructure mapping, and 5) visualization of route and infrastructure data.

3.1 Geospatial User and Perception Survey

A geospatial survey that allows the responses to be geographically analyzed was developed to better understand the use and perceptions of residents. Both web-based and print versions of the survey were available to participants. The surveys incorporated a variety of questions from instruments such as the

National SRTS walkability audit and the PEDS – Pedestrian Environment Data Scan, among others. Questions were reformatted to work in a system that has been geospatially enabled and designed for presentation using responsive web interfaces.

Youth and their parents took the I-WALK for Schools survey together, thus allowing them to discuss options for walking to school. The survey asked respondents to identify where they live and to respond to several questions regarding their perception of the walkability of their neighborhood. The questions included an assessment of the neighborhood sidewalks, issues related to speeding or driver behavior, and other concerns the individual had about walking to various destinations. Additional information from the survey indicates with whom respondents walk most of the time, the number of days per week participants walk or bike, and opinions on whether their community encourages walking and biking. Also, youth were asked if they would be interested in taking part in sponsored walking programs such as a walking school bus.

Survey respondents were asked to identify the routes they use or would consider using by drawing on paper or via web-map interface. Youth were asked to draw the routes they walk or bike to school. Surveys developed for older adults asked respondents to identify the community locations to which they currently walk or bike and to draw the routes they walk or bike most frequently, as well as the locations to which they wish they could walk or bike. Once entered, the data were processed in a GIS model to create a weighted map identifying the routes. Only routes identified by more than three respondents were printed on the map to maintain individual privacy (Figure 2). In addition to user routes, participants pinned the locations of intersections they perceive as dangerous as well as other barriers that make walking or biking difficult. These responses and comments were categorized and displayed as data layers on a series of maps provided to the community in a final report.

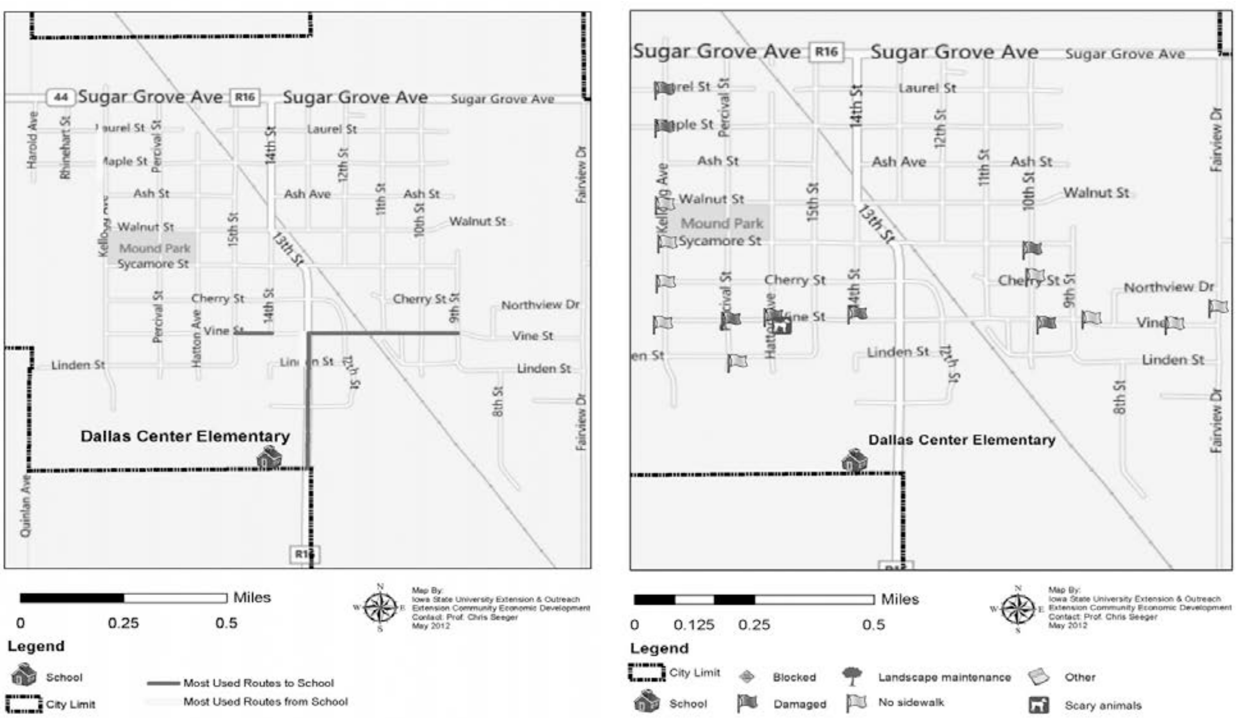

Figure 2. The most frequently used routes to and from school and a map identifying the locations of barriers perceived by parents and youth to impact routes to school provide valuable insight to planners.

3.2 Infrastructure GPS Mapping Workshops

Utilizing an f-VGI approach, university and local public health program leaders facilitated a one-day mapping workshop for community volunteers. The pool of volunteers taking part in the workshop consisted of members of the local coalition and other residents who may have learned about the workshop though news outlets or social media. Typically 12–24 volunteered took part in the workshop.

Volunteers had the option of using their own smartphone or one of the 12 iPhones that are part of the I-WALK toolkit. In a 45-minute orientation during the workshop, facilitators explained the types of features the volunteers would map and trained them to use the customized mobile mapping. Following the training, volunteers were paired together and assigned locations to assess. Assessments were conducted at each intersection and midblock. Additional data for random features were also assessed. After completing their assigned area, volunteers returned to the workshop and the data were uploaded to an online mapping system and displayed on an overview map indicating which parts of the community had been assessed.

The software utilized in the mapping workshops was initially built upon the ESRI ArcGIS iOS framework but has since been ported to the Fulcrum mapping system (Figure 3). Questions were tailored to the type of environment the user is documenting (e.g., intersection or midblock). Participants evaluated the location by first identifying the type of feature they were evaluating (sidewalk, intersection, or other) and then responded to a series of questions by simply tapping the correct response. The assessment form utilized responsive question branching that modifies form questions based on initial responses. For example, if the user indicated that there are no sidewalks, the questions involving the sidewalk condition and width were omitted from the form. After entering the pertinent information, users identified the site on the map by either placing a marker at their current location using assisted visual map placement (AVMP) or via the phone's GPS. Additional barriers to pedestrian and cyclist movement such as vegetation growing into the walkway, excessive truck traffic, or cars blocking sidewalks were also mapped using the GIS app.

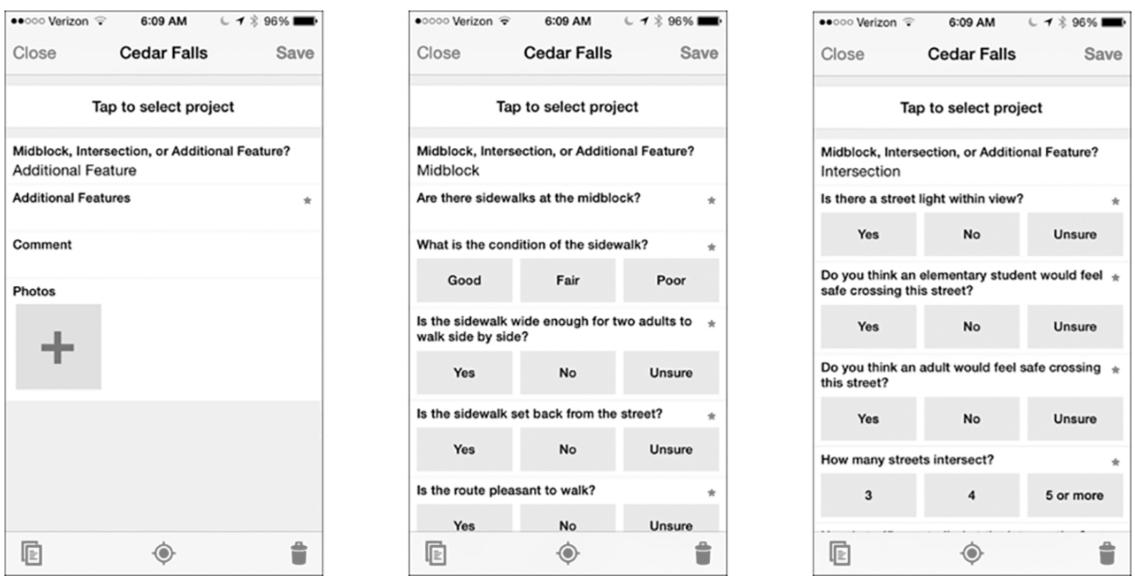

Figure 3. Fulcrum mapping app customized to document infrastructure.

4 RESULTS

The I-WALK program has been successful for public and private schools in both urban and rural settings, as well as for programs focused on community walkability for older residents. To date, more than 350 Iowans have taken part in forming local coalitions, while 450 community volunteers (including residents and students) have collected more than 1,000 photos during the infrastructure assessment workshops. More than 2,100 parent/child surveys with more than 2,500 mapped locations of perceived barriers/opportunities and 850 identified routes to school have also been submitted.

While the collected data continue to include some error that varies from community to community, sample analysis indicates better than 92% accuracy without conducting a secondary review in most established areas. An initial analysis of each data item collected by volunteers in one community identified that approximately 88% of the infrastructure items inventoried were located, assessed, and entered correctly. The remaining 12% were identified as having some sort of error, incomplete data, or simply missing.

- 4%: The locations the research team had expected the volunteers to document were skipped. Most of these locations were in areas with no sidewalks or in areas currently being developed. To remedy the issue the instructions on where and what to evaluate were improved.
- 5%: The attribute value for the particular location was omitted. In many cases this was a result of a question dealing with lighting or street parking. The interface to record the information was improved to allow the user to select an unsure option via a more easily accessible button selector.
- 3%: Miscoding an attribute likely do to the user pressing the incorrect button. Switching to the FulcrumMaps app helped to alleviate this issue by making it easier for the volunteer to correct the error while in the field as opposed to adding an additional correct point or trying to remember to correct it later with assistance from the research team.

Collected data were analyzed in a GIS to help community leaders identify gaps in the existing network as well as locations where citizens perceive there to be safety issues such as speeding traffic, reduced visibility, or inadequate sidewalks. Responses have also been used to identify the locations of barriers along what would otherwise be a satisfactory route. Locations where there might be an opportunity for improvement were also identified. Collectively, this information helped communities prioritize areas to improve and write grant proposals that contain up-to-date details of the current infrastructure needs.

Pre- and post-surveys of volunteers found that as residents examine their community and collect data through the participatory process, they experience and witness the limitations of the non-motorized transportation options. Community coalitions are made stronger as residents who might not have responded to a general request to join a “community walkability committee” are now more willing to participate in future discussions and take leadership roles in the development of the local coalition.

The data collected from both the survey and infrastructure mapping were analyzed and consolidated into a report for each participating community. Web-mapping interfaces were designed to allow coalition members to explore, query, and overlay the collected data. Several of the participating communities have used these data to help secure funding to implement infrastructure improvements, create walking programs, and generate better understanding by officials of the need for improved pedestrian systems.

5 CONCLUSIONS

Equipping the public with discipline-specific knowledge and extending the methods of landscape architecture into decision making empowers residents to communicate with powerful outsiders, such as district transportation planners and county engineers, about community needs and desires for specific types of change. The data generated also support grant writing to secure external funds to build infrastructure, another essential need for small communities that wish to make transportation improvements. Community-based participatory research and the facilitated-VGI approach to collecting data have generated increased citizen buy in to the project while providing the base data to start to visualize this information. Future steps for communities involve the continuous updating of this information as identified in I-WALK’s core mission. Tools to assist with this process are currently being implemented into several of the participating I-WALK communities to allow them to visualize the improvements as they are made.

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