

# Connected Messages: A Maker Approach to Interactive Community Murals with Youth

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## ABSTRACT

Connected Messages brings together traditions of engaging youth in designing interactive murals with themes relevant to their lives and new low-cost networking technologies of connecting local groups with global audiences. We describe the design of a community mural that functions like a public display, which can be remotely programmed through an online interface. The implementation with Maker Mentors in five Free Library branches with over 1,000 youth focused on different aspects of youth maker agency in accessing, participating, and expressing their ideas. In the discussion, we review key dimensions expanding youth and Maker Mentor participation in community-relevant designs.

## Categories and Subject Descriptors

K.3.1. [Computers and Education]: Computer Uses in Education

**General Terms:** Design. Human Factors.

**Keywords:** Public display, community engagement, maker culture

## 1. INTRODUCTION

Maker activities, popular in fabrication spaces, children's museums, science centers, community organizations and maker faires (Honey & Kanter, 2013), have focused mostly on personally-relevant designs such as robots, toys, and clothing. While these designs are often created with support of others and shared with others, they leave aside the potentially rich area of community-relevant designs that could engage not only local participants but also connect to global audiences. Community-relevant designs can introduce a new genre of maker activities

that is not only concerned about teaching a particular skill set but also about fostering a sense of community. One popular application of community-relevant designs are murals found in many cities that often depict historical events, consist of messages, images or scenes built by individuals or groups who intend to preserve the spirit of the community (Golden et al. 2002).

While most communities change over time, murals are designed often to be fixed representations and thus lack the dynamic nature of digital public displays such as large-scale permanent projections and media facades. Digital public displays have the potential to allow communities to express themselves in more dynamic ways because they combine permanent display with real-time participation and bridge the personal and the local with online communities. Efforts here range from the pioneering work by Brignull and Rogers (2003) on *Opionizer* that led participants voice and share their ideas, to Peltonen et al.'s (2008) *CityWall* projects that led children display their designs, and to Hsi and Eisenberg's (2012) recent *Math on a Sphere* project which provided children with a programming language to create and share designs for spherical displays in public science centers. Digital public displays, while inviting contributions and interactions, often lack the sense of intimacy, community voice, and identity that traditional murals possess. Relatively modest, low-cost, DIY public displays can be as effective as expensive infrastructures such as video walls, plasma screens, or interactive surfaces in creating intimate and meaningful interactions. Seiting et al. (2009)'s *Urban Pixels*—a display system made of low-cost, programmable, networked and unbounded light sources—uses wireless light emitting units that can integrate to urban environments in different configurations to create different visual patterns on the facades of buildings. Here, users can selectively activate individual pixels by turning them on or off or control them remotely in groups using their phones and customize the look and feel of the display. Taylor and Cheverest (2012) discuss an even more low-cost display strategy that combines printed and digital postcards that would allow photo sharing during a village fair. In the spirit of public bulletin boards, the project utilizes simple postcard designs to lower the barriers of

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participation in rural communities. Here, hand made designs created by the locals and digital postcards sent by remote participants are brought together to build a display that fosters a sense of belonging within the community.

It is within this larger landscape of interactive, participatory, and public displays that we situate the design and implementation of a community mural, called *Connected Messages*, that combines the empowering nature of city murals with the dynamic qualities of digital displays. In the design of our interactive community mural, we pursued a maker approach that fostered a do-it-together mentality, to build on a sense of ownership by encouraging youth to realize their public image together. We report on the design and implementation of *Connected Messages* with youth ages 6-19 and a group of Maker Corps Mentors in Philadelphia Free Library branches. This work draws on Philadelphia’s longstanding tradition as “The City of Murals” (Golden et al. 2014) where over 3,600 murals have transformed the city into a canvas, highlighting the community-building power of collaborative art. We examined two aspects of the approach in more detail: youth’ maker agency and maker mentor support in accessing, participating, and expressing their community ideas and concerns by asking the following questions: What impacts youth participation in and expression of community themes at different sites? How can mentors support youth voice, making, and technical learning in community-relevant designs? In the discussion, we address how this maker approach to public displays can allow for not only increased community engagement but also provides the opportunity to incorporate more computational engagement.

## 2. DESIGNING CONNECTED MESSAGES

The *Connected Messages* mural consisted of the following components: (1) physical foam boards for displaying and connecting message boxes created by participants, (2) tile-like message boxes made by youth with one LED, and (3) a website that displayed a virtual representation of the mural and allowed the LEDs to be controlled. Each ‘blank’ *Connected Messages* board (see Figure 1) consisted of a 4x4’ piece of foam board purchased at a local art supply store, strips of adhesive copper tape laid out in an overlapping grid, an Electric Imp hardware module, a 16x8 LED matrix controller, and a 4G modem that connected the board to the internet. Youth decorated the lids using markers and installed a single white LED in the box using two conductive copper traces. When these traces were connected to 3.3 volts, the LED inside the box would turn on and illuminate the design on the lid. Once the box was pinned to the copper-tape grid on the board, the LEDs in the boxes could be turned on and off from the main website. These board and materials were installed in five library branches across Philadelphia.

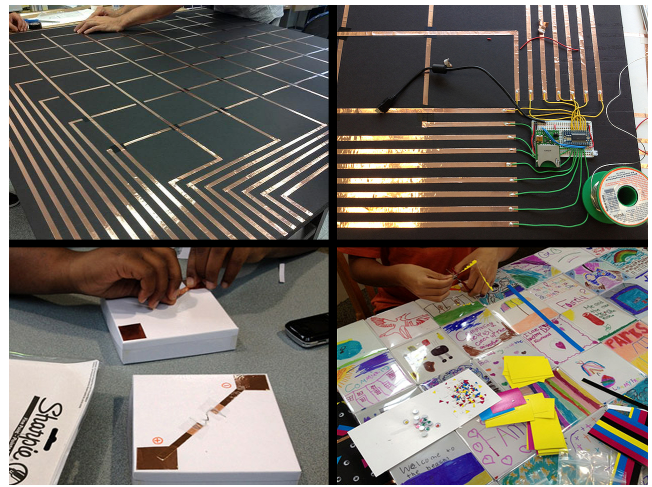


Figure 1. Foam board with copper traces (upper left), Electric Imp and a modem (upper right), back of tile boxes with copper connectors (lower left), and tile boxes with designs on board (lower right).

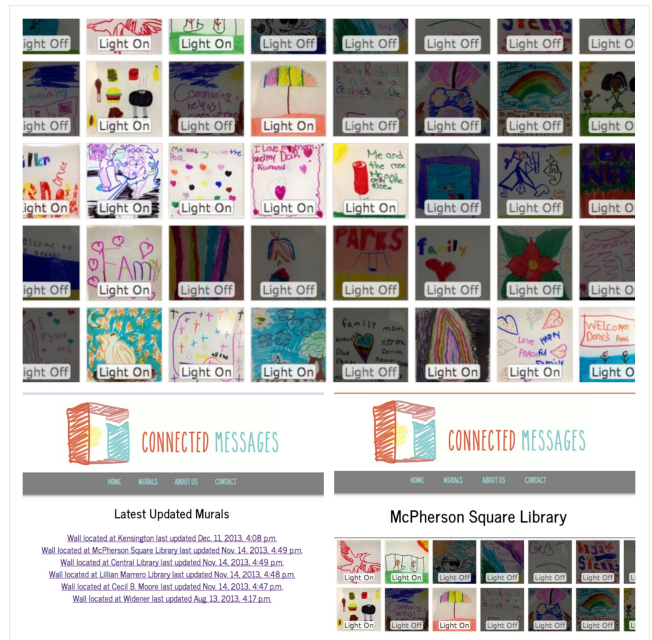


Figure 2. Connected Messages website interface.

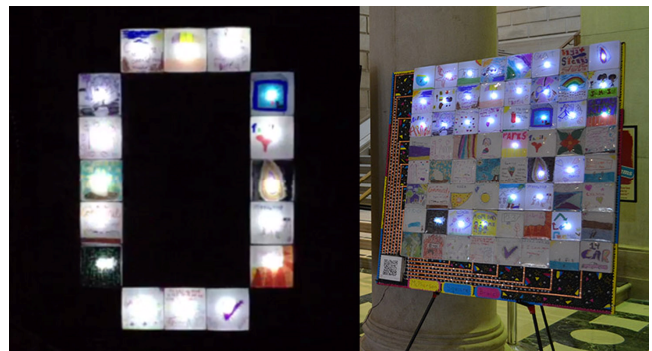


Figure 3. Connected Messages: Letter “O” scrolling (left) and selected lights on (right).

### 3. MAKING CONNECTED MESSAGES

The *Connected Messages* murals were set up and designed during the summer of 2013 in five Free Library locations in underserved neighborhoods across North and West Philadelphia. The mural activities were led by five Maker Mentors, a team that consisted of three men and two women, ages 21-31, with backgrounds as working artists and undergraduate students (Chemistry, Industrial Design and Engineering majors). The Mentors were trained as part of a Maker Ed Initiative grant to lead workshops in electronics, arts, and crafting. The research team together with the Maker Mentors designed and constructed the boards and materials, which were then delivered to each site. Our evaluation focused on observations of youth maker activities in library branches and debriefing interviews conducted with Maker Mentors.

#### 3.1. Observations of Youth Makers

A total of 1,036 total youth participants, between ages 6-19 years, participated in *Connected Messages* activities, their daily participation fluctuating from three to thirty participants. Youth and mentors at each location developed a theme for their board based on conversations relating to the themes (e.g., bravery, kindness, acceptance, anti-bullying) of Lady Gaga's Born Brave Bus Tour, which visited Philadelphia in March 2013. The most striking differences were found in themes for the boxes adopted in each site. While all of them started from Lady Gaga tour themes, the mentors realized in order to imbue a true sense of ownership in the project, the making had to be personalized. One library location—embedded within a nonprofit whose mission is to reduce the recidivism of adjudicated African-American youth—created boxes that addressed recent school closings versus new prison construction, their perspectives on the Trayvon Martin trial, and choosing positivity and creative outlets over perpetuating violence. As the mentor explained, “[The participants] took each problem as an interesting challenge and made it their own. It was easier to scaffold their learning to the point where I could be almost completely hands-off during their making.”

The sites also differed substantially in terms of participation, access, themes, and completion of the community mural designs and illustrated some of the challenges in implementing such maker projects across different sites, albeit in the same city. Participation varied and depended on the nature of implementation and instructor expertise at each *Connected Messages* site. At one branch, the board was filled within one week. The Maker Mentor, an artist with no maker or computing background, described his tactics in encouraging engagement in likeness to his artistic process: “Drawing and painting is all creative problem solving, If you can step up and get closer and see the smaller parts, it make it much more tangible to someone who is uncomfortable with their own skills.” In contrast, the Maker mentor at another library location had a strong technology background. At this site, several of the participants got to the point where they were able to scan their designs to flash drives and upload them for the website. While many youth were interested in how the board and the website functioned, they never dug deeper into the technical back-end. He recounted, “The coolest part is the breakthrough—when we had to do documentation for it, they all worked on Mozilla and they would help piece together the html and the website.” No matter which technical orientation, at all sites youth and mentors alike found it gratifying when the boards lit up.

Access to the boards also differed significantly across sites and thus impacted community involvement. The site that locked their board in a conference room and opened it three times a week was the last to finish and the maker mentor had to mount many of the boxes herself. In contrast, the site that displayed the board in a prominent, high traffic area for optimal visibility generated more interest in the project. The mentor recalled that creative process became very personal to participants, “in the end some got into heated debates over who could present our work to the community.” *Connected Messages* culminated in a local Maker Celebration, which brought together all five board plus a blank one, which visitors of the Celebration could complete with their own messages. Over 50 youth presenters and over 100 additional attendees gathered in the lobby of the Central Library to display their messages of community. Participants had the opportunity to share the meaning behind their postcards, as well as the technological knowledge they accumulated over the summer by helping attendees create their own postcards. One of the boards was also connected to the Internet and visitors could type in a message and see it scroll across the LEDs.

#### 3.2. Reflections of Mentor Makers

At the completion of *Connected Messages*, we interviewed the five Maker Mentors about their experiences in supporting learning, production and expression of community voice, and their own learning. Mentors encouraged participants to explore the project in self-directed, inquiry-based approaches that allowed for differing levels of engagement. One mentor described his style as informal; “I’m for more of just exploration, getting into the nitty gritty, not necessarily a top-down approach but just guiding kids through what they’re interested in.” Several Maker Mentors recalled that youth described their neighborhoods of North and West Philadelphia in a way that echoed census statistics on drug abuse, violence, and low education: “It was a bit sad to hear their initial responses of *not safe, no good*.” In response, mentors often shifted the conversation to a more asset-based approach that focused on positive aspects, “One of them wanted to make a box about recycling, not because the community is all that trash-conscious, but because it’s something he wanted to say he feels is important to making a community healthy.” By challenging a negative, dominant narrative and supporting curiosity, youth were able to expose personal stories about their communities. One mentor described that the process became organic, “I quickly learned that kid input and project driving needed to be a priority of mine... Informal exploration time allowed me to connect with my kids a bit more.” A learning outcome of *Connected Messages* was a basic understanding of simple circuits. A mentor explained, “I think the majority understood the idea that the leads on the board all were positive/negative and how that had to operate.” In attempts to spark more interest he continued, “I took off the barcode box [showed them the hardware] just so they could see what was under the hood.” In future iterations of the project, mentors agreed that exposure to back-end, hardware construction would be a great impetus for deeper learning.

### 4. DISCUSSION & NEXT STEPS

In our evaluation of designing and implementing *Connected Messages* we found that providing youth with agency in building the physical mural fostered their participating and expressing community ideas and concerns. We utilized a maker-oriented approach and provided each participant the basic components to build a “pixel” message box that became the building block for expressing ideas about community and composing a larger public

display. In this process, message boxes began to gain secondary meanings based on their neighboring tiles and more importantly started to embrace a more collective role of combining individual efforts with a group sensibility. This also succeeded in drawing in participants and establishing an audience, which has been a key issue for many communal displays (Agamanolis 2003). It was, however, less obvious how to engage members in the making of the technical backend of the board and web site.

In re-designing our approach, materials, and processes used in Connected Messages, one challenge for us is to design an interaction process that unfolds from simple to the complex in multiple stages that are parallel to the learning objectives. We could definitely engage youth more in the process of laying out the boards, introduction to soldering and materials and give them more time to play with/see what other sites are doing (engage in peer production, peer learning via the internet). A good parallel to this is Eisenberg's Math on a Sphere, where people can write basic programs in LOGO and see the output displayed on a giant, public sphere (Hsi & Eisenberg, 2012), participants could learn to write simple programs to send or receive HTTP requests to control the mural. A curriculum could be developed that taught kids python by having them program simple animations and games for the board. Furthermore, we could engage youth in learning how to write word filters that screen out offensive terms.

Perhaps an even more important measure of community engagement, is that *Connected Messages* continues to be a successful program and community object in five libraries because of its accessibility and flexibility in allowing all community members to engage in a dialogue based on community selected themes. It has provided an opportunity for the community to create personally meaningful parts of a larger object, much in the way that their personal voice serves as a piece of their community as a whole.

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