Formative Evaluation in Participatory Design:

Central Y Gardeners

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This project was realized in ITEC 825, Formative Evaluation in Instructional Design,
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OVERVIEW

An urban demonstration garden in San Francisco's Tenderloin needs to connect its physical and virtual environments. Quick Response (QR) bar codes may provide ubiquitous, low-friction linkages that promote communications within the Gardens' teaching and learning community via mobile phone and web browser. This method of connecting physical experiences with virtual information also stands to improve accessibility to people with differing abilities. Both assumptions need to be tested on a small scale before deployment throughout the learning system makes sense. This document describes a formative evaluation of QR codes deployed in a community-based environmental education program.

Learning Context

The Central Y Gardeners' community learning system is focused upon amplifying the resources of a legacy garden at 387 Golden Gate Ave in San Francisco's Tenderloin neighborhood.

The Gardens serve an ethnically and culturally diverse community based in the more than 150 year-old Central YMCA.

Renamed the SYL Central YMCA in 1998 and then relocated in 2009, its garden was originally established on the rooftop of the historic 220 Golden Gate Ave building in early 1980's and was moved by volunteers to the site of the proposed new green building during the relocation.

Today, two full years into the move, the Demonstration Gardens form a primary support of interim programming as Y Members, staff and the surrounding community define the "next 150 years" for the organization. This programming aspires toward discovery, a cross between "Citizen Science" [NSF, 2010] and public participation planning [Wates, 1987]. From the Golden Gate Ave sidewalk the garden site looks like a kind of urban 4-H club with its greenhouse, raised beds of vegetables, tree boxes, pond, sheet-mulched surfaces and "Biome Wall" – a 120 ft wall planted with native plants organized to represent the ecozones within the Mediterranean Biome, of which we in Northern California are a vibrant part, even in the City. One thing marks it unmistakably as a YMCA, though; a regulation basketball court rules off the center of the lot, signaling the multiple demands upon the physical site. People from 2 to 82 use this precious outdoor space for gardening, T'ai Chi, all forms of ball, meetings, festivals, scooter races and sitting quietly. What used to be done in 10 spacious floors now happens on a floor-and-a-half indoors and outdoors on the 85' x 125' asphalt lot. The demands on resources are intense, the population dense and the atmosphere dynamic as everyone works to understand what health, greenness and community mean without the physical space formerly accustomed to.

Assumptions that guide the work of establishing a system that supports community-based learning include public participation planning & structured decision-making drawn from the domain of Geography & Environmental Science; cognitive apprenticeship, universal accessibility (UDL) and Action Learning drawn from domain of Learning Theory; underpinned by technologies of social networking and cloud-ware.

Community-based education seeks to expand the sense of possibility within a population, rendering individuals more adaptive and the commons more resilient; responsive both to adversity and opportunity. A learning system that supports this mission puts tools in people's hands that empower their own best visions while making sure that everyone, irrespective of ability, age or background is enabled to grow individually, participate, contribute to the general well-being and see the effects of their work. These are large goals that must be served by small, deliberate steps.

Requirements

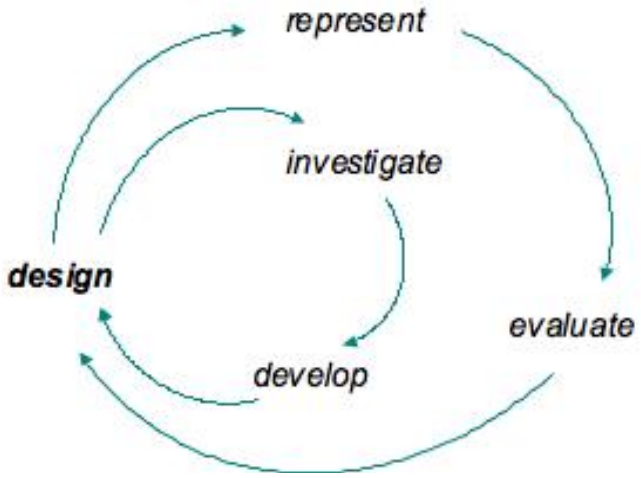
- Develop the physical garden as a research lab for Citizen Science and the future of the Central Y
- Facilitate volunteerism
- Establish an online environment that supports environmental education through social learning [Gardner- activate 5 minds(disciplined, synthesizing, creating, respectful, ethical), Piskurich/Buczynsky – action learning]
- integrate online or virtual experiences and resources with real-time environmental teaching and learning requires a working bridge between these states
    - Spatialize memory by orienting virtual and physical experiences
- All ages and abilities accessible. Create an accessible environment [apply UDL principles re CAST; multiple means of representation, means of action & expression, engagement]

Metrics

In contrast to school-based instruction excellence is measured in (multiple means of) engagement and exchange, in dynamism rather than mastery. A community learning system at its most basic allows a community to plan for and manage its own development. Measures that gauge participation, engagement and positive flux in attitudes, perceptions and capacity are the most useful and as described above must operate upon the mediation of virtual and physical experiences.

EVALUATION DESIGN

Objectives



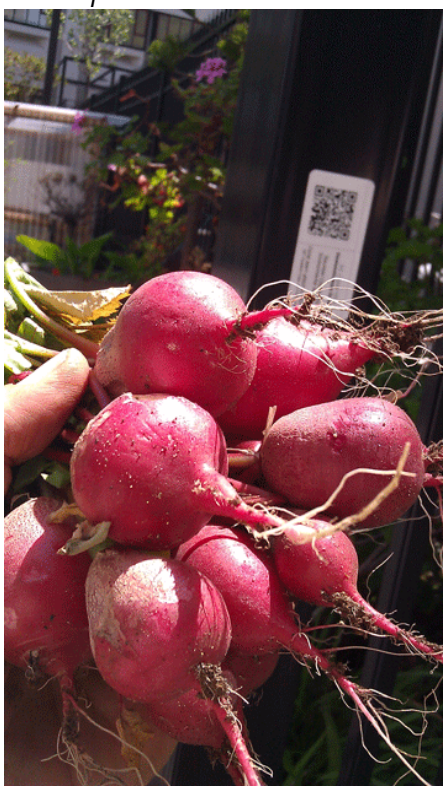
In participatory design, partners from within the community that the design serves are significant contributors to each phase and the overall evolution of the design. Evaluation of the efficacy of the design includes measures of partner engagement. At each step questions about what people want must be posed in ways that yield authentic answers. [Wates, 1987 p115-119]

For this phase of development the design of the gateway between virtual and physical experiences is assessed by people who will use it using the tools that are proposed for deployment: mobile phone with a camera that's either connected directly to the internet or can send a picture to a computer that is online.

Test subjects (Evaluators) are members or visitors to the YMCA or passers-by on the surrounding streets; people representative of the demographically diverse community of the Tenderloin Y. Moderators are members of the community invested in connecting the garden with the wider neighborhood. [See Appendix A for Participant Profiles]

[diagram label, phone, picture, browser, UI]

Checkpoints



Cherry Belle radishes & QR code on Larkin St entrance

Ease of use in different modes and formats to

- Access content
- Contribute content
- Generate content

Pathway 1: Mobile phone links visitor in physical garden to online resources via QR barcode in real time.

Pathway 2: Mobile phone sends photo of QR barcode to garden visitor's computer linking to virtual resources for participation / use asynchronously with garden.

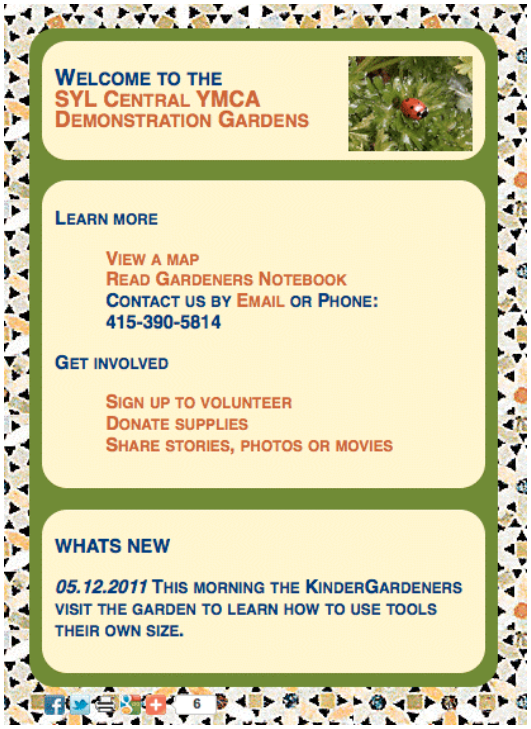
Pathway 3: Online computer links virtual garden visitors to physical garden resources and each other in real time.

This report describes testing of Pathway 1 and 2 only since Pathway 3 would change significantly if QR barcodes needed to be replaced with another method of linking real and virtual resources.

Workflow

In the initial condition, Moderator, Evaluator and an observer/recorder work together using mobile phones. They are within camera range of a QR barcode label for the Y Gardens.

Step 1: The Moderator opens the Pathway 1 evaluation script, Observer opens input form and records background information to begin evaluation (See Appendix B: Sample Instruments).
Step 2: The Visitor points phone camera, allows auto focus and captures image of barcode.
Step 3: Depending upon the model of the phone the Visitor may be prompted to decode the image or asked if they want to email it or upload it. The Moderator records the Visitor's responses.
Step 4: If the Visitor is able to access the internet via phone the Moderator prompts Visitor to interact with online resources, OR
Step 5: If the Visitor needs to access Garden materials in the computer lab the Moderator opens Pathway 2 evaluation input form either on a desktop or mobile and completes the evaluation.

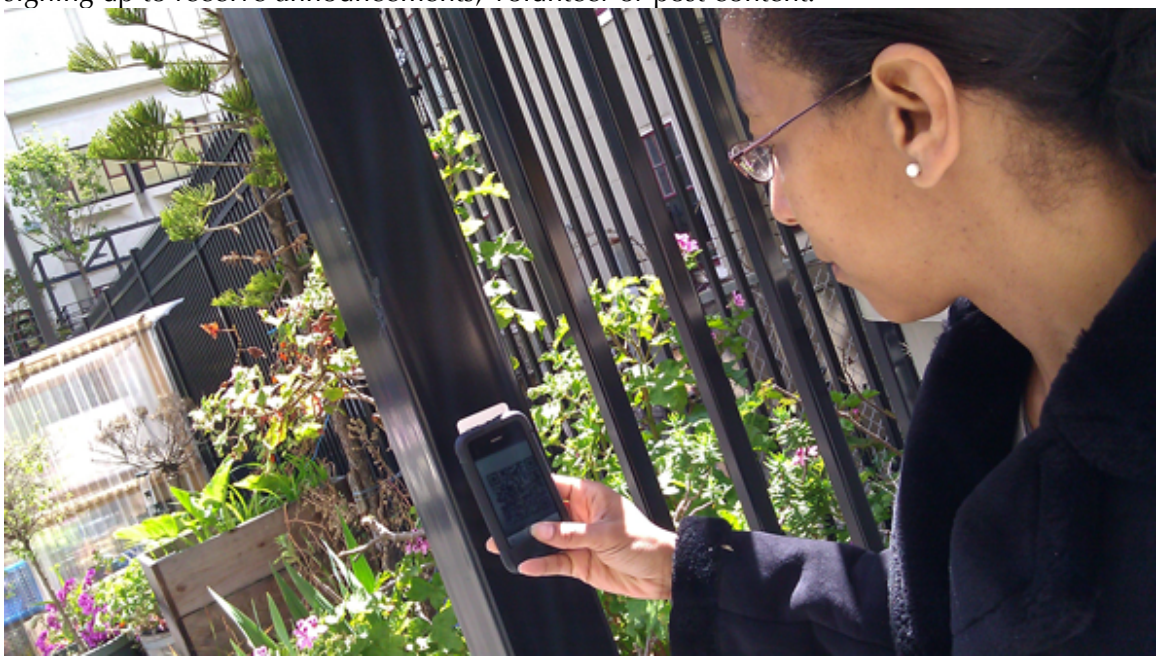


This evaluation is set up to branch conditionally. If in testing Pathway 1 the visitor's mobile phone is able to only photograph the barcode but not to decode and open a browser to access online materials the test branches to Pathway 2 and the visitor and moderator decode the picture of the barcode in the Y computer lab to test asynchronous use of Y Gardens materials.

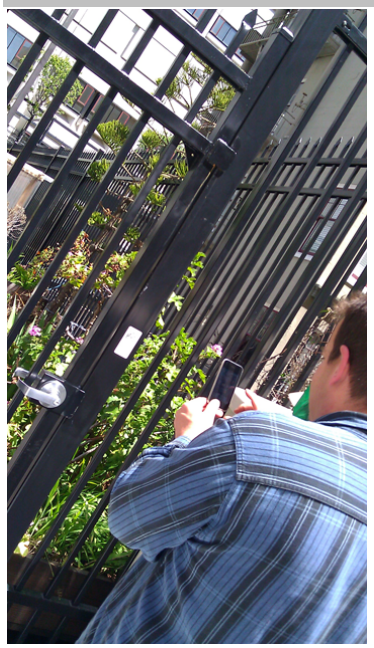
RESULTS

Five pairs of Visitor-Moderator teams were initially employed to evaluate Pathways 1 & 2 linking virtual and physical resources. The author served as observer and contrary to original plan documented interactions in the input evaluation form to allow the Moderator greater freedom to support the Visitor and evaluation process. No one received compensation to participate. This may have biased the study by selecting only participants who were supportive of the Garden or curious about the method for intrinsic reasons.
Of the five teams, two branched into Pathway 2; that is, they needed to decode and interact in the lab. Four of the five needed to be shown how to use native functions of their phones to complete the tasks. All five were able to complete the tasks within fifteen-to-twenty minutes. All Visitors reported high interest in the method and were motivated by curiosity to complete the tasks. Following up, of the original five Visitors who signed up in the course of evaluation only two have investigated further, however the Moderators have all increased their participation and support for gardening activities. No one expressed doubt or skepticism about the basic method of access, no one has opted out of communications with the Gardens. All found passive actions (including browsing, viewing photos & movies and reading the blog) agreeable or better on a 5 point scale. Individual

Visitors showed most variance in their interest levels in participatory actions such as signing up to receive announcements, volunteer or post content.



Analysis



QR codes are novel. Developed for industrial use in Japan, in the US they have not been associated with product tracking but with public performances, raves, flash mobs and other vanguard art events.

Younger users in particular were inclined to respond positively to this cache and to associate the garden with this positive affect. In contrast, technological novelty for older users can create a barrier to use but in Cycle 1 Evaluators there was little evidence of deep generational barriers. Perhaps this is an indication that novelty was successfully balanced by minimal interaction points in the mobile interface. All Evaluators were receptive to the design and apparently motivated to explore and experiment with this method of connecting with the Gardens.

Although there seems to be great potential, particularly for visually impaired participants, no claims can be made at this time as to accessibility of QR coded connections between the physical and virtual garden since it has not yet been tested with disabled users. Plant collections, learning modules and mentoring sessions are all good candidates for connectivity set in motion through this relatively simple method.

RECOMMENDATIONS

Cycle 1 testing prompted rapid iterations of the mobile user interface which will require ongoing evaluations, particularly using Evaluators with different abilities and backgrounds that authentically represent the surrounding community.

Simplicity in the user interface is rewarded by increased participation, at least initially. Going forward we'll begin to explore ways to use the 'Kasbah' paradox; that is, when something appears bigger on the inside than it does on the outside to organize complex online virtual resources and make them memorable.

We must continue to look for multiple means of expression, representation and engagement, especially in processes of setting objectives. More graceful methods of generating feedback loops between visitors and the Y Gardens as represented in its community learning system will tie investment and expectations more closely. Closer linkages will allow conservation of knowledge about the community and the evolution of its needs over time. It will generate an atmosphere of proactivity about planning, sharing information and learning in the neighborhood and its people.

Appendix A: Participant profiles

Team	*Moderator*	*Evaluator*
Blue	JS - Mentorship Coordinator (staff)- 34 yrs. White male. BA Psychology, MA Counseling	TA – Youth member- 16 yrs. Latino. Junior in public high school, musician.
Green	CE – Volunteer youth counselor- 25 yrs. Latina. College Junior, kinesiology	AG - Youth member-13 yrs. Black, female. 8th grade, private Middle School.
Gold	BC – Senior Member, 77 yrs- Black, female. Retired Union representative. High school graduate.	CT – Senior Member- 68 yrs, white male. Retired longshoreman, 2 yrs college.
Red	JO – YMCA Coordinator staff- 31 yrs. White, male. BA. Seminarian.	LW – intern, 19 yrs- Chinese female. Junior college student, marketing.
Purple	*PJ – Youth Member – 17 yrs. Black, male. High School senior, musician.*	*GM – Youth Member- 12 yrs. Latino. Public Middle School, wants to be a firefighter.*

Appendix B: Sample Instruments

Physical Signage

Sticky labels printed by the sheet and posted in the neighborhood of the Central YMCA.

Moderator Script: QR Code connects Physical and Virtual Garden

Cycle 1 Formative Evaluation Spring 2011

Evaluation teams have three members: Moderator, Evaluator & Observer.
Observer documents the test, Moderator guides and supports the Evaluator as needed.

Before the test

Moderator outlines the extent & components of the test so the Evaluator knows what to expect. Questions about "why?" can be delayed until after the test is complete. It is important to be clear that this evaluation isn't pass/fail, that no sincere answer is wrong, that all questions are fair. Make sure the mobile phone you are going to use is charged and that the camera works. The Observer needs a working device that will record sound or video and access to the input form via the internet. Only make commitments about sharing data and information that you believe you can keep.

" There are 3 parts: 'Context' which includes questions about equipment and Evaluator background; 'Accessing the Garden resources' is about what the Evaluator sees, perceives and likes; 'Interacting' tests uploading images, writing to a blog, tests signing up to volunteer."

During the test

Allow Observer to prompt you to move the process along.
The main objectives are to see how the Evaluator uses the interface and learn how to make it better.

After the test

Let the Evaluator know that their information is invaluable in developing the project and invite them to come back to the Garden and work or follow-up. Ask them if they want to help with additional cycles of evaluation or in any other way.

Evaluation Input Form

This form is interactive and available from
http://humanorigins.org/lab/labproject/cls/testbed/eval-form-main.html

Universal Usability Checklist

This evaluation tool is a synthesis of Usability heuristics [Norman], Accessibility Guidelines [ADA] & Universal Design for Learning [CAST] in an interactive form.
It is designed to be included in the CLS Toolkit.
Available from:
http://humanorigins.org/lab/labproject/cls/index.html

Appendix C: Resources

Central Y Demonstration Gardens (Mobile)
http://humanorigins.org/gardens/Gardenmobilesplash.html

Community Learning System Model
http://humanorigins.org/lab/labproject/cls/index.html

Formative Evaluation Tools
Sample data sets & session logs
Universal Usability Checklist (CLS toolkit)
http://humanorigins.org/lab/labproject/usability/index.html

Updates to these reports: Formative Evaluation in Participatory Design,
Central Y Gardeners build a community learning system
Available from
kasberry@humanorigins.org

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