

# The Collaborative Practices and Challenges in Community Gardens

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## ABSTRACT

Community gardens are places where, as a collaborative group, people grow food for themselves and others. Community gardens are particularly beneficial for people who do not have their own land for such purposes. Through an observational and interview study, we investigate the collaborative practices of community gardeners, how these practices are organized and performed, and what challenges community gardeners face when using technology. Our results show that community gardeners have duties to fulfill their responsibilities as a member of the organization. They share knowledge and tools during working in the garden. They have social events to develop the community. In these practices, digital and non-digital tools are used to support gardeners' collaboration. However, challenges of using these tools are presented because of the unique nature of community garden. We discuss these issues and suggest design directions for interactive tools in the situation of community garden to foster gardener's collaborative activities.

## Author Keywords

Collaboration; community garden; urban agriculture; community building

## ACM Classification Keywords

H5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous.

## INTRODUCTION

*"For a lot of people it's an opportunity to get out and convene with your neighbors, to do something really practical with your hands, and have that real pleasure of working together."* [23] — *Mary Clare Zak, Social Policy Director for the City of Vancouver, Canada*

Community gardens are farmlands used for planting food by people in urban areas, typically by residents with restricted access to their own land [1] (Figure 1). Community gardens started at the turn of the 20th century and, because of food shortages, increased in numbers during the world wars. Nowadays, migrants are often attracted to community gardens so that they can continue their cultural traditions. People dedicated to family health also show strong interests towards community gardens because of their organic nature [21]. Individuals who have limited access to food stores because of inadequate finances or inconvenient transportation can often gain access to community gardens because they usually are built within

neighborhoods [22]. This makes community gardens places that encourage sustainability, city greening, neighborhood harmony, community building across cultures and ethnicities [18,20,24]. Gardeners also believe that community gardens benefit society [9] by turning urban "blight site" into peaceful, friendly and wonderful places through collaborative activities [19].

Community gardens are clearly places that foster a unique sense of collaboration and community. However, we have little understanding around the specific activities that community gardeners do, how technology is used, and what collaborative challenges community gardeners face. For this reason, we have conducted an observational study of six community gardens and their activities along with interviews with ten community gardeners who rent plots and routinely work in community gardens. To foreshadow, our results show that community gardeners have duties to fulfill their responsibilities as a member of the organization. Besides working on their own plots, members often collaborate to manage each other's plots and perform community garden tasks. To develop a better community, gardeners have a variety of social. Embedded within the above practices are the use of digital and non-digital tools that support gardeners' collaborative activities. With this comes a variety of challenges that gardeners face related to the assignment of work, scheduling meet-ups, staying aware of garden activities, and sharing knowledge. These challenges present a variety of opportunities for design.



Figure 1. A community garden containing multiple enclosed boxed plots.

In the following sections, we first outline the related work on community gardens and the use of technology to support them. Second, we describe our study methodology. Third, we present our results. We conclude with a discussion of our results and what they mean for the design of future technologies for community gardeners.

## RELATED WORK

Over the years, a lot has been written about community gardens. Yet much of this work focuses on the political and social impact of community gardens. Studies have shown that community gardens are viewed as locations promoting community building more than sites for food production [18]. Community gardens provide a site where residents develop friendships, learn to share, exchange seeds and help each other in cleaning and building [2,7,18]. There are also useful and practical books or articles that provide more details about community gardens and how to take part in gardening [11,17,22]. Other writings focus on topics such as education or health issues associated with community gardens [4,6,10] as well as the influence of leisure on gender roles and relations [5]. Power et al. [16] found that community gardening presents an engagement between active human and non-human actors. They describe community gardening as a dynamic process that includes collaboration, negotiation, challenge and competition to extend the traditional view of gardening. Overall, such articles are valuable to understand the broader goal of community gardens, their benefits to society, and cultural issues; however, they do not present an understanding of gardening practices in a way that can inform technology design.

There are several papers that explore the application of technology into community gardens. Pearce et al. [15] introduced an internet-based application that helps gardeners analyze water amounts in their gardens. Qu [18] developed an interactive installation that augments physical gardens with virtual flowers to explore how the physical environment and digital projection can be naturally merged. Bidwell et al. [3] proposed seven themes to inform design that could realize the appropriate combination of nature and computation. Themes related to placing value on nature, supporting identity and belonging, and respecting the fragile nature of the environment.

Most closely related to our own study is ethnographic work by Odom [13] that focuses on understanding the practices and values of community gardeners. As part of this work, Odom conducted observations and interviews with gardeners to explore their daily activities. Results showed that community garden members lived in creative ways and appropriated unused space and 'useless' materials for fruitful reprocess. Members had different opinions on using interactive technologies in their gardening. Some believed that relying on technological systems could limit the growth of gardeners' gardening knowledge. Others felt that interactive systems might help new gardeners interact

with more experienced gardeners to help build relationships amongst gardeners. Following from this, community members were invited to a participatory design workshop focused on understanding how interactive systems could be designed to support community gardening. The workshop proposed three design tactics - "*recoding food waste as fuel for a metabolic city*", "*amplifying visibility of urban agriculture practices in and on city infrastructure*" and "*engaging diverse stakeholder groups*." Based on these tactics, Odom raised several design opportunities, including designing technologies that: bridge the gap between local restaurants and urban gardens to suggest better uses of food waste; publicize urban gardening practices to a wider range of citizens; and project virtual urban agricultural sites into spaces that could be used for food production in the future. These design opportunities focused on combining resources, stakeholders, and urban food practice into a single 'organism.' While valuable, the research did not explore how community gardeners collaborate in a way that could inform interaction design. This is our focus.

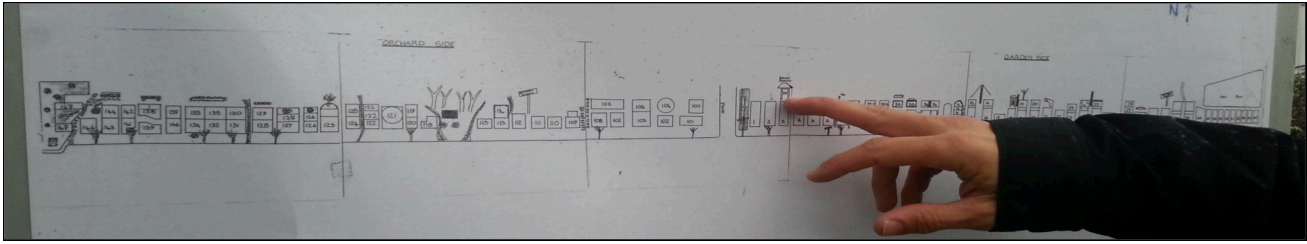
## STUDY METHODOLOGY

To understand the collaborative practices of community gardeners, their use of non-digital and digital tools, and any challenges they might face, we conducted an observational and interview-based study.

### Observations

We conducted observational studies in six community gardens in Metro Vancouver, Canada. Three of them were located in parks while three were in other neighborhood areas, including one next to a public transportation train line. Three were located near houses and three were near apartment blocks. The gardens had different shapes and sizes: some were regular squares, and some were long and narrow. Garden members included Canadians as well as a large number of immigrants from other countries including China, Japan, and India. Not all members spoke English and some only knew it as a second language. Figure 1 and 2 show community gardens from our study. The gardens varied in size from only a few plots to gardens with over 100 plots. Each garden was managed by a non-profit society made up of local residents who were members of the garden. Our observations consisted of three activities:

1. **Garden Tours:** We took tours of all six gardens with nine different people. Two of these gardens were visited twice. Each tour lasted up to 30 minutes. The participants introduced different locations in the garden and described the activities they have around these places. During the tour, we asked questions and took pictures.
2. **Team Meeting Observation:** We performed observations in a compost team meeting for one of the gardens. Four gardeners met in one person's home for this meeting. We watched gardeners' discussions and took notes without interjecting in the conversation. We specifically focused on member discussions around community gardening practices and challenges. We captured photos of



**Figure 2. The layout of a long, narrow community garden showing plots in both square and rectangle shapes.**

the meeting and agenda and audio recorded all conversations. The observation of this team meeting lasted two and a half hours.

**3. Workshop Participation:** We participated in and observed an allotment design workshop for one of the gardens. Here we collaborated with eight gardeners to create a multi-person gardening plot. We engaged in specific tasks, asked for help and support from others, and completed our plot design together. This observation lasted for three hours during an evening and focused on the collaborative practices amongst the gardeners, where and how they did these practices, and what tools they used during these practices.

**Semi-Structured Interview**

We recruited 10 gardeners (5 females) from the same six community gardens using a snowball sampling technique. We asked our circle of friends who were community gardeners to ask their friends and families about participation. We also sent emails to the organizers of many community gardens. Gardeners’ ages ranged from their 20s to 60s. Six participants had children in their family. Seven were garden committee members who took on a larger organizational within the gardens. Participants covered a range of gardening experience: some had only recently started participating in community gardens, some had a year or two of experience, and others had many years of experience. When selecting participants we purposely aimed for a diversity of experience in order to learn about a range of perspectives and practices.

Interviews were all conducted during the sowing season of Spring 2013. Interviews lasted between 30 and 50 minutes. Prior to the interview, each participant was given an outline of what types of questions to expect and was told that data would remain confidential and anonymous. Interview questions asked the participants about their practices with other gardeners, the ways they collaborated, their motivations for participating in these practices, and their practices and preferences for using technology during community gardening. For example, questions included “*what activities do you do with others and how do you perform them?*”, “*why did you decide to participate in the activities?*”, and “*how do you inform other gardeners when there is a activity coming up?*” We also had gardeners show us and discuss the technology and non-technology based tools that they used to support their practices. This

included schedules, meeting records, name lists, and financial records. We also asked participants to tell us about their memorable collaboration experiences. Throughout our interview process, we iteratively refined the focus of interviews as we collected more information. During the interview, a recording pen was used for audio recording.

**Data Analysis**

We transcribed audio recordings and then performed a thematic analysis on the transcribed data (photos and notes). This involved coding data into themes based on our interpretation of the data. We develop themes by looking for code segments that represented information we expected before the study, the surprising information we did not expect to find, and information that was interesting or unusual. After the development of themes, we organized them to make sense of the data. Lastly, we represented and visualized the data in a matrix.

In the following sections, we describe the main findings from our study. First, we describe the organization structure of the community gardens. Second, we outline the activities gardeners did within the community garden. Third, we describe gardening activities that move outside the confines of the community garden to people’s homes. Within each of these areas, we focus on the collaborative activities and practices that occurred and the challenges that community gardeners faced.

**ORGANIZATIONAL STRUCTURE AND DUTIES**

Each community garden that we studied was organized and run by an elected board of directors. The start of gardening season each year was marked by an Annual General Meeting (AGM), usually in March or April. The AGM—normally the first activity in which gardeners gathered in person—was used to clarify membership, guidelines, policies, and responsibilities. AGMs were held in nearby community centers and all community members were encouraged to attend. This way they could renew their membership, listen to reports of the past year’s activities, be reminded about community policies, vote for a new board of directors, and agree upon a budget and other motions.

Members were obligated to volunteer time for one year and participate in activities to ensure and advance the development of the community garden:

*“A minimum of one hour per month volunteer time is required of all ongoing garden members with plots, with 8*

hours by August 31 and a minimum of 12 volunteer hours completed by December 31. Plots shared between members share the 12-hour minimum.” [8]

Some community gardens asked members to sign up for tasks on a sign-up sheet during the AGM. This would allow them to fulfill their hour obligations.

*“The first time is that we had a sign up sheet. Then you could sign up which team you were interested to join. You put your name down. On the second year, we just ask do you want to stay at this team or you want to change.” – P4*

Naturally, in order to sign up for jobs, community members actually had to attend the AGM.

*“The paper sheet, I think, is a great and simple way to say yes. I mean you put your name down and the next person can see your name. It’s an honest, direct way to express that you are interested or not interested in the team... The weak point is that you have to be there to put your name down. You have to be at the meeting. If you are sick, then you have to do it by email next day. So it’s hard to reach people.” – P4*

In the spring, new gardeners were invited to the garden to take a tour guided by the organizer. They were introduced to other gardeners and informed of how to use the facilities in the garden, such as water pipes, compost boxes and tools in the shed.

Most of the gardens we studied had their own website where information was posted for gardeners, especially those who missed events like the AGM. Members could also use the site to follow the news and process of the garden’s activities.

*“We post all of meeting minutes on the website or any updates or events that are happening. So members can go to the website or other community people from this area just go and check it out. It’s very simple blog website... Notes of meetings are also published on the website in case people missed the meeting or they want to know what are we doing.” – P2*

Policies or guidelines are also posted in the websites after each AGM. For example, in the website of one garden, gardeners posted guidelines about using the shed, compost system, common garden areas, etc. While beneficial, this information was not often accessible when a person was actually at the garden, unless they carried a mobile device with them.

## **WORKING IN THE GARDEN**

Our study showed that working in the community garden contained a set of basic activities: working on individual plots, collaborating during vacations, working in shared areas and communal plots, sharing knowledge through signs and sharing tools. We describe each and focus on the shared activities that occurred.

## **Individual Plots**

At the most basic level, community gardens contained plots of land used by individual members. Plots were selected for individuals on a first come, first served basis. This involved an organizer taking the new members to the garden and showing them the available plots along with a picture of the garden’s layout (Figure 2). The selection of plots was recorded on garden layout map. Each plot has a number on the map and also at the plot’s physical location.

Throughout the planting and harvesting season, gardeners come and work on their plots to plant, tend to, and pick their harvests. Yet work is not typically a solitary activity. As gardeners work their plots, they often talk to each other on topics of gardening. They share gardening knowledge, planting stories, and help one another learn. The following quote describes an individual’s first hand learning of a situation, which was later shared amongst many gardeners:

*“Once there were slugs which are very bad for vegetables in our garden. People cannot use pesticide because we want to keep our food organic. I had heard that slugs don’t like to crawl over anything abrasive, so I got to thinking of what I could attach to the wooden border around my plot that might discourage them, and I came up with light wire screen mesh, which I stapled to the border, and it seems to work. I have told many others about this, and many have taken it up.” – P3*

Gardeners told us that they liked gardening when there were other gardeners in the garden at the same time. This allowed them to engage in conversation and discussion, and receive help. Yet in reality, it was very rare for gardeners to all come to the garden at the same time, unless a special work party was scheduled (discussed more later). When new gardeners faced planting problems (e.g., slugs), this meant they were not able to get help from more experienced gardeners. Gardeners sometimes tried to plan when they would go to the garden in order to be there when other more experienced gardeners or gardening friends were present. However, there were no convenient mechanisms for them to check how many gardeners were present at the garden before going there and whether or not they knew the people currently at the garden.

In cases where gardeners did manage to be at their gardens at the same time, we found that many were not able to easily see each other or talk because of the distance between their plots. This further created a gap between new gardeners and experienced ones.

## **Collaboration During Vacations**

Community gardeners also collaborated to manage each other’s plots when people were away on holidays, or could not come on a specific day when work needed to get done. Often in the summer months, this meant ‘shared watering’ amongst plots. To coordinate such efforts, the gardeners we interviewed told us they sent emails to all of the other members of the garden and shared their plot numbers

through a Google Group. This allowed them to see who was available to help with their plot.

*“Last year, there were six of us who shared watering, like people who were on vacation, someone send email, saying does anyone want to be a part of watering circle, so I said yea. So then there were six people who responded and said yes. So whenever one of those six was going away and sent an email to other five says can someone water for my garden. And someone would say ‘yes, I could do these days’, the other ‘I could do these days’, so it is covered. Actually, I really like that. That is to be a part of community, too. You know, help each other a lot.” – P7*

In addition to looking after plots, we learned that some gardeners would take pictures of other people’s plots with their phones and send them to the holder of the plots over email when they were on vacation. This helped owners get a periodic understanding of what was happening at their plot.

### **Shared Areas and Communal Plots**

All of the community gardens we visited also had a composting box for community members to jointly use. The composting system involves mixing garden organic waste and providing conditions that encourage decomposition [12]. While seemingly simple, we found that many gardeners needed to learn how to compost materials and properly use it on their garden plots. Providing shared knowledge on how to compost was done in periodic group workshops (described later) as well as through in-person conversations between gardeners. This information was often shared by garden organizers who would informally teach compost knowledge to other community members while they were in the garden area. For example, one of our participants had a university degree in soil science and was also a part of the ‘compost team’ in the garden: a group of people responsible for maintaining the compost so others could use it. He told us that his best experience in the community garden was teaching autistic members how to use compost bins in their own garden plots.

*“They were very interested in gardening, very interested in composting. They were very happy to learn. That was my favorite. Working with other garden members, talking about gardening, talking about compost.” – P8*

Many community gardens also had communal plots that multiple garden members were responsible for. Gardeners donated their time and work to these areas and shared the harvest after a season. Members collaboratively managed and shared the harvest from communal plots. Some gardens also donated food from these plots to neighbors’ homes. While beneficial, communal plots caused additional challenges. Gardeners typically did not have shared knowledge of what tasks needed to be done to the communal plots. This often caused problems with a lack of watering or re-watering by garden members.



**Figure 3. A weathered sign next to the compost box.**

### **Sharing Knowledge through Signs**

Of course, those people who were knowledgeable on topics such as composting were not always around the garden at the same time as other gardening members. For this reason, all of the community gardens we visited utilized paper signs in various places for members to exchange information and knowledge. For example, signs were often located next to the compost boxes to provide instructions to garden members on how to properly use the compost. Figure 3 shows the compost sign at one of the community gardens we visited.

*“If you look at the compost system, I made some signs, basically what do you put in the compost, so for examples, when do you turn the compost, for the short rules. This box is for fresh; this box is for turning; that box is finished. So they are very simple and clear signs for communication.” – P8*

We also found that garden members would sometimes create ad-hoc message boards with paper and place these in various areas of the garden. Community members could use them to write messages for one another on an ongoing basis.

*“In our shed, there is a board, people can write messages there. It is a community message board. There are older members and people who don’t have much money. They don’t have computers. So we can’t make everything digital.” – P8*

Although signs and message boards were easy to make and could be created and placed by anyone in the garden, they brought with them challenges. First, as can be seen in Figure 3, paper signs were easily weathered even with protective plastic covering or laminate. They were also prone to being ripped or blown away in the wind. Second, we observed that signs were sometimes hard to read and understand, especially for people who did not speak English or learned it as a second language. The gardens we visited contained many migrants to the country and, thus, it was common for this case to arise.

Community garden members also had strong needs to have a more common set of information available for its

members, in addition to the specific instructions posted on signs. This included information about upcoming garden events or general rules and policies for the garden. Not all community members had computers and email so each garden we visited used a large notice board, such as the one shown in Figure 4, to present and alert garden members of particular information. The information usually included the introductory information for the community garden, policies and guidelines, and upcoming events. The content of the notice board was typically a subset of the content on a garden's website because of the board's limited space. Board contents were often in an enclosed area behind glass and only accessible by the garden's organizers. This meant that the contents on it would not be weathered. Yet it also made it so the boards were not accessible for posting by all community members. For example, when a gardener would learn about a discount on fertilizer in the nearby gardening store, he or she could not directly use the notice board to share the news with the other gardeners. Garden members also told us that they often wanted to take notes on the information posted on the notice board so they would have it available at home. Because it was paper-based, they had to memorize the information or copy it down on other pieces of paper to take with them. Copying information was not always easy: gardeners might be wearing gloves, have 'muddy hands,' or not have paper or a writing utensil ready-at-hand to use.

#### Sharing Tools

All of the community gardens we observed also had communal sheds that members could use. The shed was a small structure that gardeners kept tools in for shared usage. Each garden had a set of shed guidelines. For example, the gardener who is the last or only person using the tools is required to return the tools and ensure that the shed is locked. All gardeners were responsible for maintaining the garden's shed, including cleaning inside and around the shed, returning tools where others could find them easily, and contacting organizers when the lock was broken or tools were lost.

Sharing tools was not always an easy process. We were told that it was common for tools to be broken or lost. Gardeners also frequently brought in their own private tools for this reason and placed them in the shed. This sometimes brought up issues over which tools were communal, which were privately owned, and what tools a person could or could not use. Moreover, not all gardeners followed the guidelines to clean and return the tools after they used them. Therefore, effective management of the tools in the shed was a challenge for gardeners. Some gardens created a paper-based list that showed which tools were available for usage; however, these were only useful for gardeners to check and did not easily support the recording of new information about the tools. Thus, it saw breakdowns when tools were lost and the list was no longer accurate.



**Figure 4. Notice board for sharing general information.**

Sheds were also useful beyond the storage of tools. Because sheds were often the first place that community members would go to when they arrived at the garden, they were often used as places for posting sign-up sheets for special work parties and other activities (we describe work parties later). Thus, they acted as a notice and sign-up center. For example, sheds were often the location where 'sign in' sheets were placed for work parties.

#### SOCIAL, WORK, AND LEARNING EVENTS

To foster collaboration and knowledge sharing, the community gardens we observed all created social events and work parties for their members. Interviewees told us that this helped new gardeners learn from more experienced gardeners. We describe the various styles of social events and their benefits next.

#### Work Parties

Work parties were held in different months throughout the year. This was the most common set of community social event and included a diverse set of 'parties', such as a cleanup party, 'compost-turning' party, and a 'fixing and building' party. These parties encouraged members to gather in the garden and do tasks collaboratively. It was also considered a requirement of being a community member to attend these parties. Gardeners generally felt involved and engaged in these work parties. In fact, many participants in our interviews told us that their best experiences in the garden were building the garden together with other members during these events.

*"I was amazed by people when we built the garden in that three months. I thought the neighbors were so boring, there was no community, nobody says 'Hello'. But when we were building the garden that I saw they are all showing up, they worked and you can come talk to them and when they say they are coming, they will be here, always. They enjoyed it! It was amazing. It is quite fun." – P4*

While work parties certainly create good experiences for gardeners, they also bring challenges. For example, since tools are shared and difficult to fully control, the management of gardening tools remains a problem.

*“There were some accidents happened. I remember after our cleaning, the bags for leaves were not enough. Some people were asked to buy more back. What surprised me is that a man took the garden’s trolley to his personal garden without permission.” – P5*

#### **Scheduling Work Parties**

Scheduling and planning work parties was a challenging task for all of the community gardens that we studied. Time scheduling in the context of community gardens is different from normal meeting and appointment scheduling at work where a company may have access to a shared calendaring system, or where employees have a shared culture of calendar scheduling. Garden organizers have little knowledge of when people are available for work parties. Instead, work party planning involved organizers sending emails to community members to find available dates and times. Despite this, organizers often did not know how many people would show up because not all members would reply to emails and some simply did not read their emails. In a similar fashion, organizers also tried using Google Groups to post information about work parties rather than trying to find a mutually agreeable time amongst community members. This was more convenient for organizers yet some community members did not like the ‘more advanced’ technology.

Some community gardens used a scheduling poll through Doodle Poll to see when people were free. Here people would select free dates and times for the work activities. This overcame some of the disadvantages of the emails; however, because many gardeners were older adults, they often did not find new technologies like online scheduling systems to be appealing. This made organizers feel like the technology was unreliable.

When community members were not consulted about selecting a work party time, some community members would become upset. Most gardeners had families and worked full time jobs. The restrictions of urban life often took them ‘away’ from the garden. For example, a community garden organizer showed us the email she received from a gardener:

*“Work days – they are always scheduled for a Sunday which can be problematic. Perhaps give people the option of a job board... This offers more flexibility which is important to our gardens demographic of working people.” – Email excerpt from P6*

#### **Planning Work Party Tasks**

Work parties were typically structured by organizers who created a list of tasks that needed to be accomplished. Community members would then be assigned these tasks or asked to volunteer for them. Yet community members often

had a difficult time clarifying what tasks needed to be done for a work party and which were assigned to them. Some organizers tried to describe tasks in email but this was still not always clear. Others tried using a shared document with Google Docs where they would list and assign tasks for work parties:

*“I made up a Google doc where we posted jobs and as people volunteer their names was put beside the job.” – P6*

However, we observed that such shared documents only listed the title of jobs and people could not clearly understand the skills, estimated time, tools, and specific spaces in the garden that were required for each job. Moreover, there was no way to understand the actual hours a gardener would need to spend on each task. This made it difficult for community members to know if they could attend the work parties given their existing schedule.

As a result of these issues, we were told that work parties often had low participation, despite it being a required community member activity. One of our interviewees comments on her confusion over tasks:

*“I got informed by mails about some tasks, but I felt that I am uncertain about many of them. Because of not clear about the difficulties of these jobs by email, I was not able to make sure that I am competent to it. That’s why I gave up many opportunities to work in the garden.” - P5*

One could conceivably learn the specifics of a work party task when at the garden to complete the task; however, as the quote above shows, community members wanted to know what tasks they would be doing ahead of time so they could assess whether it matched their skillset and would be a valuable use of their time to attend.

#### **Workshops**

Most community gardeners were amateur gardeners. Besides reading books, learning from the Internet, and talking with more experienced gardeners, the community gardens we studied held gardening workshops for members to learn more about gardening.

We learned about two types of workshops. First, some workshops were held inside the community garden. In these cases, professionals would give talks around the beehives or compost boxes to other gardeners. In these situations, gardeners would stand together in the garden, listen and talk. These inside-garden workshops were practical and lively. However, they were easily influenced by the weather and surrounded noise and it was sometimes difficult for people to record information about what they were learning.

Second, many workshops occurred away from the garden. This was told to us by participants and we also experienced it firsthand. For example, the “Allotment Design Workshop” we participated in was held in an activity center on the first floor of a building near the garden. During this workshop, the teacher instructed garden members on various plants, their growing patterns, and tips for planting.

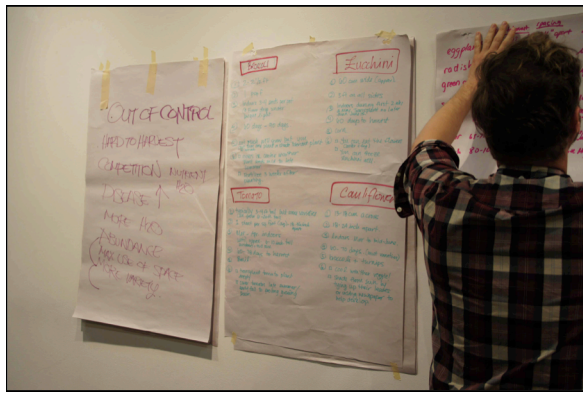


Figure 5. Using paper to teach in a workshop.

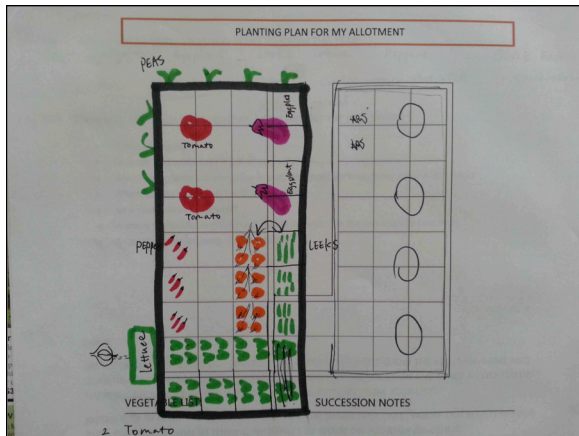


Figure 6. A planting plan for allotment.

Information was shared on large pieces of paper attached to the walls (Figure 5). This non-digital presentation of materials reflected the ‘organic’ nature of the gardening activity. Some workshops were also held in meeting rooms of a community center where gardeners were able to use slides and projectors for showing pictures and text. In addition to the presentation of materials, participants also engaged in hands-on activities where they planned out their own garden plots (Figure 6). Most participants of the workshop found the information relevant and useful; however, it was often difficult to relate the information obtained in offsite workshops back to the real setting of the community garden because they occurred ‘out of context.’

### Potlucks

We also found that community garden members participated in potlucks in their community gardens during the summer months. Similar to the AGM and work parties, members planned and communicated about potlucks over email. Coordinating who would bring what items was sometimes challenging. In the potluck, gardeners gathered in the community garden and invited their families and friends to share the joy of the harvest.

*“We have dinner potlucks in the summer in the garden. Most food is from the garden, like salad. We all bring*



Figure 7. Relaxing spaces for non-gardeners.

*dishes together to the garden and after the dinner, we clean together, like one family.” – P10*

Potlucks not only provided opportunities for people to share food and music, but they also promoted cultural exchange.

*“We have dishes from different countries and cultures, say, Indian food, Chinese food and Japanese food, and of course western food. People with different native language gather in the potluck, we all felt good.” – P3*

### ACTIVITIES BY NON-GARDENERS

Several community gardens also had relaxing places that attracted non-gardeners to the garden area. For example, Figure 7 shows a picnic table in one of the community gardens. People from the ‘general public’ were welcomed in these spaces and were often seen there in warmer parts of the season eating or relaxing.

*“People sometime have picnics there and I put chairs there last year from my home. So people would come and sit there and read if when they are going to a movie. A lot of people from the restaurant sit in the garden when they have a coffee break and at nighttime. So in the summer time, it’s very well used.” – P6*

As one might imagine, having non-gardeners come into the garden is sometimes problematic. Since they are not familiar with the garden, it can be easy for them to not understand the rules. For example, there are beehives in some gardens and if non-gardeners fail to read signs, it can present dangerous situations for them.

Community gardens also face issues with stolen food since the gardens are open for the public to enter. Our interviewees told us that it is especially heartbreaking to find one’s crops stolen after an entire season’s hard work. Thus, it is difficult to protect a garden’s harvest and, at the same time, keep the garden a public space that encourages community building. Some gardens have created communal plots as “Theft Plots” where they encourage thieves to steal food from with a sign suggesting this as opposed to stealing food from members’ plots. Some interviewees said they would like to install fences, however, this would detract from the ‘community’ aspects of the gardens.



## **DISCUSSION**

This study has explored the practices of community gardeners by investigating a diverse set of collaborative activities, places, and tools. We first outline a range of design opportunities based on the work challenges that exist in community gardens. Following this, we explore the additional issues in designing to address these challenges.

### **Design Opportunities**

Our study has pointed to a large number of areas where technology could aid people working in and organizing community gardens. First, there are opportunities for technology designs to provide garden members with better and easier access to information about their community gardens. In the community gardens we studied, policies and guidelines were often posted on the gardens' websites, which were hard to access for gardeners when actually at the gardens. Garden members alternatively used paper signs and notice boards, however, these faced issues with weathering or access control. Gardeners also only passively understood and remembered the information.

Second, there are design opportunities to better connect gardeners with one another for the purposes of knowledge sharing. New gardeners often face challenges in meeting more experienced gardeners in the garden to talk about gardening knowledge. In Odom's study [13], he also found that interactive systems are needed to bridge the gap between new and more experienced gardeners. Based on our findings, we build on Odom's work to show that there would be value in designing systems that allow gardeners to check which gardeners are currently present in the garden. It would also be helpful if gardeners could 'see' the garden even if they were not there. This may help workshops that occur in settings outside of the garden, and it could help solve problems with food thefts in the garden.

Third, there are design opportunities to help gardeners track and manage tool usage. Tools are easily misused, broken, and even lost in community gardens. Interactive technology could be developed to help gardeners clearly distinguish private tools from public ones, become informed when tools are broken or lost, and track who uses tools and when. This could also be useful for organizers to know how many hours the gardeners devote in work parties. Of course, this could easily create feelings of 'Big Brother' watching. This would need to be carefully mitigated to strike a balance between awareness and privacy, and maintain feelings of 'community' in the garden.

Fourth, there are certainly design opportunities to help gardeners schedule and organize work parties, events, and other tasks. Collaborations are not always satisfactory because of the ways such activities are currently organized and managed. Current scheduling and task management technologies offer some promise to gardeners but the specific context of the community garden makes the use of such tools more challenging (e.g., computer knowledge, language issues, etc.).

As we can see, there are many opportunities for interaction design and technology development in community gardens. However, more importantly, there are some deeper issues that make designing for community gardens complex.

### **Design Challenges**

Community gardens are an oasis in urban environments where people grow food and enjoy nature. Odom [13] found that his participants sometimes had a desire to resist technology because it may detract from their goal of learning from the environment. For example, they did not want technologies to tell them about soil information. Instead, they preferred to learn this on their own. Participants in our study were mixed when it came to technology. Some tried to actively increase the amount of technology that was being used by incorporating information management and collaboration tools into the gardening practices. Yet others resisted it. This illustrates that gardens are unique environments where even if technology is valuable, not all may desire it, and it can easily detract from the activity of gardening itself. Thus, it is certainly a challenge to make technology 'fit' in the organic nature of community gardens. Based on this issue, community gardeners may value technologies more if they were created from reusable materials and using sustainable environmental practices.

Our findings also show that community gardeners have a variety of ethnic backgrounds. They are from different cultures, speak different languages, and have different educational experiences. These differences make it difficult to exchange and read information in the garden. Designers will need to carefully think about how systems can be designed for a variety of cultures. This may involve using pervasive expressions of information. For example, a picture showing the steps of using compost boxes may be more useful than several passages of English words.

Our study also illustrates that community gardens are public places and frequented by non-garden members. This makes it challenging for situating technology in them. On one hand, community gardeners value the 'openness' of their gardens because it enhances the community spirit of the neighborhood. Yet on the other hand, they certainly do not like theft, be it with tools or produce. One could imagine that digital technologies placed in a community garden would be even more at risk of being stolen. The cost of such items may even certainly increase over non-digital tools. For example, a digital display as opposed to a notice board is certainly more expensive as would be a digitally enhanced gardening tool (e.g., for location tracking) over a normal tool.

### **Limitations**

Our study was conducted in Vancouver, Canada, and, as such, our findings may not necessarily translate to other community gardens around the world. There are thousands of community gardens in other cities around the world and each is likely to reflect the make-up and culture of the

people who live in these areas. Canada contains a large mixture of people with many different ethnic and culture backgrounds. Vancouver itself is highly diverse and multi-cultural with a large number of residents who have migrated from various parts of Asia over the last century (e.g., China, Japan, India). Vancouver and its suburbs are also typically known within Canada and more broadly as areas encouraging and focusing on sustainable practices and movements [23,24]. For these reasons, we would encourage others to conduct similar studies of community gardens in other locations and cultures. Our own future work will explore the design of new systems to support gardeners' collaborative practices based on our study findings.

## CONCLUSION

This paper has presented what we believe to be the first detailed study of collaborative practices of community gardeners in the field of HCI and interaction design. It shows that community gardens are a place for members to grow food, socialize, and establish a shared sense of community amongst gardeners and others in the neighborhood. Our findings reveal opportunities and challenges for interaction design and HCI. Opportunities relate to provide gardeners with better and easier access to information, enable them to better connect with one another for sharing knowledge, help them track and manage tool usage and schedule and organize variety of practices in the garden. Design challenges include that not all gardeners desire using technologies, gardeners have different ethnic backgrounds and technologies are hard to situate in the public environment of the garden.

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