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'Making a Positive Environmental Impact': Exploring the Role of Volunteering at a Campus Community Garden

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Abstract: Promoting sustainability in higher education is a social and environmental imperative. This paper explores how and why volunteering at a campus community garden (CCG) can serve as a unique context for promoting sustainability. Twenty-five undergraduate students between the ages of 18 and 27, who had volunteered at a campus garden, participated in individual semi-structured interviews. A majority of participants identified as female (80%) and Asian American (52%). Using reflexive thematic analysis, we first found students were motivated to volunteer for personal and academic reasons as well as to learn more about gardening. Childhood gardening experiences influenced participants' re-engagement as adults. Second, building social connections and spending time in nature, especially when living in an urban area, sustained students' engagement in the garden, whereas time constraints and physical tasks made it challenging to volunteer. Finally, the findings suggest that volunteering promoted pro-environmental behaviors. Students felt that their volunteer work allowed them to make a positive environmental impact. Participants also gained new environmental knowledge and skills, which encouraged them to adopt environmentally friendly lifestyle changes, advocate for environmental and social justice issues, and reflect on how they might integrate pro-environmental behaviors into their future careers.

Keywords: pro-environmental behaviors; sustainable actions; urban garden; campus community garden; volunteerism; undergraduate students; higher education

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1. Introduction

Promoting sustainability in higher education is a social and environmental imperative for both students and universities. Students overwhelmingly report that it is important for their university to prioritize sustainability, and almost half indicate it impacted their college enrollment decision [1]. Simultaneously, universities around the world are actively working to successfully promote sustainable actions in higher education through curriculum, research, and campus operations; however, there is an urgent need for further research and action in this area [2,3]. One important yet under-researched way to encourage sustainability is through college students' participation in a campus community garden (CCG). While there is a large body of evidence on community gardens [4,5] and school gardens serving kindergarten through 12th-grade students [6], less is known about CCGs in higher education and their role in promoting sustainability among college students. Several scholarly reviews have highlighted how CCGs can contribute to institutional sustainability efforts [7–9]. However, more information is needed, especially from the students' perspective, to deepen our understanding of how volunteering may encourage the adoption of pro-environmental behaviors.

1.1. Campus Community Gardens and Student Motivations

Campus community gardens have become a growing trend in higher education and are characterized by a dedicated space on institution-owned land designed for local community members, both on and off campus, to grow plants, fruits, and vegetables [10]. Most CCGs provide members with the opportunity to learn how to maintain a garden in a sustainable and environmentally friendly way. This opportunity is especially important for college students, who are in a developmental stage of identity exploration and increased autonomy during which they begin to form long-term habits and values, making them a valuable group to study [11].

While there is robust literature on volunteer motivations and constraints [12,13], little research has directly addressed what motivates college students to volunteer at a CCG. For example, some studies have identified broad ways universities can engage students in CCGs, including involving students through service learning, curriculum development, course credit for projects related to garden activities, or research opportunities with faculty [9]. However, to the best of our knowledge, only one study has directly surveyed undergraduate students about their potential interest in participating in a campus garden and farm. The study found that students would be motivated to participate if they could see the tangible community benefits provided by the garden, and if it were connected to formal learning opportunities. It is worth noting that prior experience and pro-environmental attitudes were not associated with the level of interest, suggesting that a campus garden could be an effective way to get students with varying levels of environmental interest involved [14]. Given that student volunteers are central to the management of campus gardens, and 98% of garden managers identify them as their main participants [15], it is important to further understand what motivates students to participate.

1.2. Benefits and Challenges of Participation in a Campus Community Garden

Existing scholarship has highlighted a broad range of benefits associated with college students' engagement in campus gardens, including increased self-esteem and community involvement [16], greater fruit and vegetable intake [17,18], and improved mental health [19] and overall well-being [20,21]. While these studies offer valuable insights, they primarily provide a snapshot of the quantitative outcomes associated with participation, rather than the process of how volunteering influenced these behavior changes.

That said, a few studies have begun to capture how and why participating in a garden can benefit students. For example, Aftandilian and Dart (2013) investigated three different garden-based service-learning programs and identified key benefits of participation, including advancing food justice, enhancing student learning, and strengthening campus–community ties [22]. Notably, the researchers found that most students began the program with little knowledge regarding food insecurity but, through hands-on work, felt more empowered to address issues of food justice by the end of the program. Similarly, another research study that captured garden managers' perspectives found that the top three benefits of campus gardens were the provision of food, community building, and formal education opportunities across 52 higher education institutions [15]. Finally, a critical review of the garden literature comparing discussed and demonstrated benefits between university and urban community gardens found that participants derived different types of benefits from each type of garden setting. For example, social, educational, individual, and university benefits were most frequently identified within university community gardens. In contrast, social, access to fresh foods, health, and economic benefits were emphasized more often in urban community gardens [23]. Together, these results highlight how community gardens help facilitate valued social interactions and connections between

different groups. The results also highlight that CCGs offer unique benefits to students and universities compared to urban gardens, underscoring the need for further investigation. While many studies have identified beneficial outcomes associated with CCGs, our study extends this scholarship by exploring students' perceptions of the benefits of volunteering and how these experiences shape their sustained engagement.

Our study also extends existing research by exploring the challenges student volunteers experience. Most of the research on challenges associated with CCGs has identified administrative level constraints. For example, Aftandilian and Dart (2013) found coordination difficulties, curriculum issues, students taking responsibility for their own learning, and pragmatic concerns as the most common challenges when implementing a CCG [22]. Similarly, other studies have reported a variety of obstacles when managing a garden, including lack of participation, insufficient funding, and agroecological problems [15]. The volunteer literature shows that student constraints are quite different from these types of administrative challenges. For example, undergraduate students reported having too many commitments, lack of time, and being unaware of volunteer opportunities as the most common barriers to volunteering [12]. By identifying the challenges student volunteers experience, this research can help inform future strategies aimed at getting and keeping students involved at the CCG.

1.3. Promoting Students' Pro-Environmental Behaviors

Another important contribution of our study is providing a deeper understanding of how CCGs can promote students' pro-environmental behaviors. Current research has made a strong case for why CCGs have the potential to promote sustainability at the student and institutional level [8,9,14,15,23]. In particular, past research shows that experiential learning observed in informal educational opportunities can lead to increased pro-environmental behaviors. For example, garden managers reported that gardens provided students with an interactive and educational learning experience that encouraged greater environmental awareness among participants [15]. Likewise, Barlett (2011) found that through experiential educational opportunities, in particular, students learned more about sustainable growing practices and deepened their connection with food and place [7].

At the institutional level, past research has found that 13 of 21 urban public universities had a CCG that played a key role in promoting sustainability on campus [9]. Furthermore, other researchers have shown that university food gardens can contribute to overall campus sustainability efforts through the provision of locally grown food, education, and community building [15]. Some scholars even argue that CCGs are forms of positive environmental communication and, by their very nature, demonstrate a university's commitment to sustainability [8]. While this research offers valuable insights on how CCGs can promote sustainability in higher education institutions, most of the evidence has come from scholarly reviews or empirical investigations conducted from the perspective of university staff. In this study, we build on the work of other scholars by using a student-centered perspective to better understand how volunteering can promote pro-environmental behaviors.

Specifically, we characterize pro-environmental behaviors as practices that promote environmentally friendly knowledge and actions that benefit the environment and reduce negative impacts at the individual (e.g., recycling more) and/or the collective level (e.g., participation in larger environmental organizations/movements working to influence societal changes) [24]. While young people generally report more pro-environmental attitudes, research has shown a gap between their attitudes and actions; those who reported the highest pro-environmental knowledge also tend to report practicing the fewest pro-environmental behaviors [25–27]. For example, Null and Asirvatham (2023) [26] surveyed undergraduate

students at a midwestern university and found that sustainability attitudes were high while knowledge was low. Additionally, students with the greatest sustainable knowledge engaged in fewer sustainable behaviors [26]. Given this attitude–behavior gap, Wyss et al. (2022) [27] investigated when and how pro-environmental attitudes turn into behavior among a sample of 1536 adults in a carbon emission decision-making task. They found that pro-environmental attitudes were more predictive of pro-environmental behavior when the environmental benefits were high and/or when perceived costs were low [27]. Our study begins to fill a gap in this literature, which has been primarily quantitative, by providing descriptive insights into a CCG program and how it may serve as an effective bridge between pro-environmental attitudes and sustainable actions among young people.

Similarly to Rohmah et al.'s (2023) systematic review of the international literature [28], a major goal of our study is to highlight the critical role higher education institutions play in helping college students transform their pro-environmental values into more environmentally responsible behaviors. Specifically, we examined three main research questions: (1) What motivated students to volunteer at the CCG? (2) What sustained students' engagement at the garden, both in terms of benefits and challenges? and (3) How did volunteering at the garden influence environmentally friendly behaviors among student volunteers?

2. Materials and Methods

2.1. Data Collection Procedures

Participant recruitment occurred in several ways. The garden coordinator shared an announcement about the study with the volunteer listserv and in their campus community newsletter over the span of several months. The research team also shared online flyers with various campus listservs, faculty and staff on the university's sustainability committee, and through word-of-mouth. Interested participants were asked to complete an electronic form to ensure they met the following eligibility criteria: (1) Above the age of 18 years old, (2) Enrolled as an undergraduate student at the university, (3) Currently or previously volunteered at the CCG, and 4) Were able to conduct the interview in English. Eligible participants were given the option to complete the interview over the phone or in-person. All participants received a $25 online gift card for completing the interview.

This research study was approved by the university's Institutional Review Board prior to study implementation (protocol number 23075; date of approval 20 March 2023). Participants were initially emailed the informed consent form prior to the interview to learn more about the study. At the beginning of the interview, the researchers also reviewed the informed consent form with all participants and obtained verbal consent. Prior to starting the audio recorder, participants verbally completed a short demographic survey to ensure their identifying information was not linked to their interview responses. A semi-structured interview protocol was used to learn more about participants' experiences volunteering at the garden. The length of interviews ranged between 25 and 45 min. The following types of open-ended questions were included: "Please tell us about the types of activities you do when volunteering at the CCG?"; "What motivates you to volunteer?"; "What is your favorite aspect of volunteering at the CCG?"; "What are the environmental benefits of volunteering at the garden?"; and "How can what you learned during your time as a volunteer influence your future career path?" Throughout the interviews, we also asked participants several types of probing questions, such as "Can you please share a little more about why ___ motivates you?" or "Why do you think ___ was your favorite part?" to encourage them to elaborate on their responses and reflect more deeply on their experiences. All interviews were recorded, transcribed, and checked for accuracy, and all identifying information was removed from the transcripts prior to data analysis.

2.2. Sample

Twenty-five young adults between the ages of 18 and 27 (M = 21.9) participated in the study. Most identified as female (80%), were in their fourth year or greater of their undergraduate education (72%), and 80% lived off campus (see Table 1). Participants self-identified as Asian American (52%), White (24%), Latinx or Hispanic (16%), and Mixed Race (8%). Twelve different academic majors were represented; the most common included child and adolescent development (20%), environmental studies (16%), and animation illustration (12%). All participants met the criteria of volunteering at the garden at least once. The total number of volunteered hours ranged from more than 9 h (40%), 6–9 h (20%), 3–6 h (16%), and 3 h or less (24%).

Table 1. Participant demographic information.

Category	Frequency	
	n	**%**
Gender		
Female	20	80%
Male	3	12%
Non-Binary	2	8%
Race/Ethnicity		
Asian American	13	52%
White	6	24%
Latinx/Hispanic	4	16%
Mixed-race	2	8%
Year in School		
Fourth Year+	18	72%
Third Year	3	12%
Second Year	4	16%
First Year	0	0%
On/Off Campus		
On Campus	5	20%
Off Campus	20	80%
Hours Volunteered		
9+	10	40%
6–9	5	20%
3–6	4	16%
<3	6	24%

2.3. Data Analysis

We utilized the six phases of reflexive thematic analysis to identify themes and patterns in the data [29,30]. Adopting a critical-realist perspective, we employed an experiential, inductive approach to identify repeated patterns of meaning in how and why volunteering at the garden influenced environmentally responsible behaviors among college students. Phase one included familiarizing ourselves with the dataset, which entailed re-reading transcripts, listening to audio recordings, and documenting ideas through memos. Throughout this immersive process, we engaged in peer discussions and critically reflected on familiarizing questions to more deeply understand participants' experiences and identify possible patterns [30] (pp. 42–45). Second, we utilized an inductive, semantic approach to begin the coding process. Specifically, we started by developing a gerund-based open-code (word that ends in "ing") for each line of text in several different transcripts. This approach allowed us to detect processes and actions (e.g., learning versus learn) as well as stay close and open to the data by using participants' words to develop initial codes that represented their language and experiences [30,31].

Based on the initial codes developed, we went through every transcript and systematically coded the entire dataset. In the third phase, once all of the data had been coded and sorted, we developed initial themes. We also utilized Corbin and Strauss' (2008) axial paradigm to help create a visual representation of the data to better understand the connections between themes and subthemes [32]. During phase four, we reviewed and refined themes. This phase was an iterative process that involved further developing the themes to ensure they represented participants' experiences and patterns of shared meaning. For example, we ensured the themes represented the full dataset and removed sub-themes that did not have enough data to support them. Throughout each phase of data analysis, we engaged in reflexivity through writing memos and weekly meetings to discuss interpretations of the data, potential biases, and reflect on the larger analytic process.

In phase five, we continued to refine, define, and name our major themes. Specifically, we identified three main themes: motivations, maintaining student engagement, and promoting sustainable actions, as well as corresponding subthemes. Finally, in the last phase, we wrote up the results, which included providing a concise, logical, and interesting analytic narrative with supporting examples. Based on Braun and Clarke's (2022) methodological recommendations, we did not provide frequencies of themes because it can produce a misleading interpretation of the qualitative data [30]. Based on the aims of the study, sample specificity, interview quality, and analytic strategy, we believe the dataset reflected sufficient information power [30,33].

3. Findings

3.1. Diagram of Themes and Subthemes (See Figure 1)

Figure 1 illustrates the main themes and subthemes identified throughout our findings section. Below we discuss each theme in more detail.

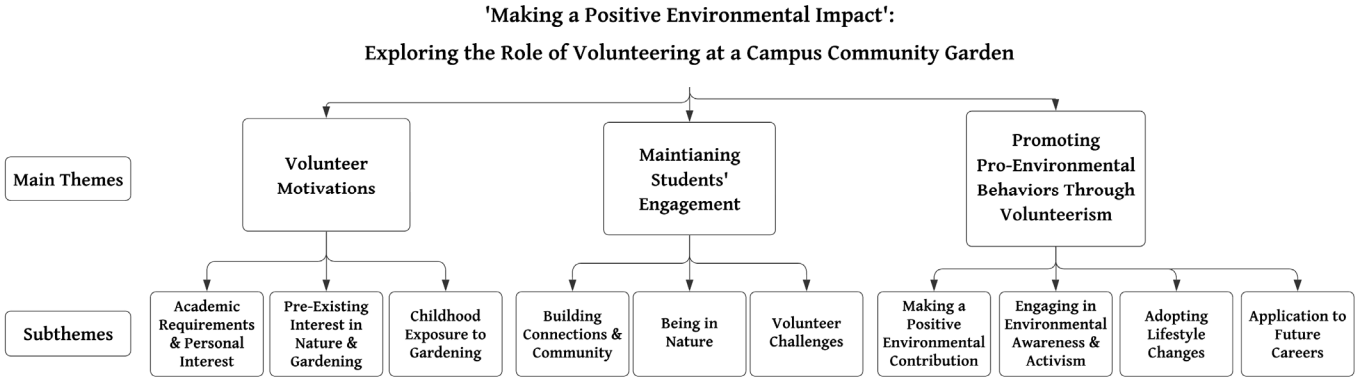


Figure 1. Diagram of themes and subthemes.

3.2. Theme One: Volunteer Motivations

3.2.1. Academic Requirements and Personal Interests

Participants shared two main ways of being motivated to volunteer at the garden. Half of the participants were initially motivated to fulfill an educational requirement, in that the garden was listed as one of many places where they could complete their required volunteer hours. Examples of academic requirements included fulfilling volunteer hours for fellowships, service-learning, college corps programs, graduate school applications, and general course credit. The other half of the participants learned about the opportunity on their own through social media, campus organizations, a friend, and/or garden promotional materials (e.g., banners, tabling, flyers). Many of these participants were motivated to volunteer as a way to get involved on campus and meet others. Several recalled seeking out this opportunity during their "first semester" or "first month" on campus as a way to

become more familiar with the university community and potentially meet others with similar hobbies and interests. For instance, Sloan shared, "It was my first semester on campus, so I was wanting to get to know others. . .volunteering at the garden was a great opportunity to get my foot into [the university]".

3.2.2. Pre-Existing Interest in Nature and Gardening

Regardless of whether they started volunteering at the garden for academic or personal reasons, most participants also discussed how their pre-existing interest in the environment motivated them to volunteer at the garden. Part of students' motivation was the opportunity to learn new gardening skills and gain more knowledge about plants and the environment in general. Students said, "learning about the environment and plants was something I've always been interested in", "I just really love being outdoors", or "I've always wanted to learn how to grow my own food" to further highlight why they decided to volunteer at the garden compared to other places they could have selected. Several participants expressed an interest in wanting to start and/or maintain a garden of their own. Whether they had a small or large space available to them, they saw this as an opportunity to learn more. Others also shared that their desire to volunteer was influenced by their coursework (e.g., on urban gardens, sustainable farming, and nutrition), which inspired them to learn more about these topics firsthand. Even though half of the participants in the study were initially motivated to volunteer as a way to fulfill an educational requirement, many indicated that they continued to volunteer after completing their hours because it was fun, enjoyable, and made them feel like they were making a difference in the community. For example, Bella shared, "So that's how I started volunteering there [to fulfill service-learning hours for my nutrition class]. But then, I enjoyed it so I just kept going".

3.2.3. Childhood Exposure to Gardening

Almost every participant in the study described warm, nostalgic childhood memories of gardening with family when directly asked how they first became exposed to gardens. Considering their past, these childhood experiences may have influenced participants' pre-existing interest in gardens and re-engagement as adults. "I've been exposed to gardening most of my life [helping my dad who grew up on a rice farm]" or "I first got exposed to gardening as a young child because of my grandmother's interest" were the types of comments participants made as they recalled their formative childhood experiences gardening. Upon reflection, some students could see how this experience "instilled in me the joy and the satisfaction of gardening from a young age". Chava shared how it made her more comfortable being outdoors today, "I'm just very grateful that I had people in my life who gardened, who could help me become more comfortable with getting in the dirt and touching bugs. I know a lot of people have that barrier".

Gardening was also a way to connect with family members and cultural traditions—for enjoyment, necessity, and family bonding. For example, Querida shared, "A huge benefit for me was definitely getting back in touch with how my ancestors lived, how they would farm, how they would plant, all of these things that they would eat and how they would live, how they would work". Similarly, Wei described how gardening was a bridge for communication with her Mandarin-speaking grandfather:

> "I think it's a little difficult for me to sometimes communicate with my grandparents because they don't speak a lot of English and my Mandarin is not very good, and so it's hard to connect over something. And I think gardening was one of those things that my grandpa and I really got along with—we're really both interested in. And I guess it just gives us opportunities to connect as well".

Most participants recalled vivid childhood memories of gardening with family that included tasks performed (i.e., weeding, watering, planting), knowledge about various plants learned (e.g., harvesting techniques, planting strategies, seasonal tips), and life lessons they took away (e.g., caring for plants, witnessing growth cycles, and understanding food origins). Even as adults, participants still expressed awe and excitement in describing the first plant they grew as a child and the feelings of accomplishment associated with eating food they had grown, such as lettuce that was used in sandwiches or tomatoes that were used to create pasta sauce. Participants expressed how it was enjoyable not only seeing the food production cycle firsthand but also in being able to share the harvest with family, friends, and neighbors.

With that said, a few participants also acknowledged that they did not enjoy gardening as children but now approach it with a renewed interest and understanding as adults. Altogether, the results highlight how exposure to gardens during childhood may have contributed to students' motivations to volunteer and learn more about gardening in young adulthood.

3.3. Theme Two: Maintaining Students' Engagement

Overwhelmingly, most participants shared that they had an enjoyable experience volunteering. Building social connections and spending time in nature were participants' favorite aspects of volunteering, whereas finding time and completing manual garden tasks were identified as challenges.

3.3.1. Building Connections and Community

The opportunity to interact with others was the most reported benefit by the majority of student volunteers. Kai summed it up best:

> "My favorite part is always interacting with the other students that are volunteering. . .it makes more community inside the community garden [as you are] not only cultivating plants. . .but also cultivating relationships and networking. And I think that's just inherently valuable".

Based on the participants' descriptions, it was clear that the garden was an inviting and inclusive space that welcomed new people. The format of the volunteer opportunity intentionally encouraged students to build connections with garden staff, each other, and the plants. During a volunteer shift, it was common for participants to take a short tour of the space, ask the garden coordinator questions, engage in an opening icebreaker activity, work in teams on an assigned garden task, and in some cases, even make herbal tea together. At the end of each volunteer shift, students were also invited to take home produce that was ready to be harvested. Querida, along with others, expressed why they appreciated this structure: "there was always something to do and nobody was ever left out, which I, especially as a person who has anxiety, always appreciated". Participants also enjoyed getting to network and talk with other students from different majors and years in school. For example, Thuy shared, ". . .it's more so about meeting different types of people. I've met a diverse group of people, and these are people who I wouldn't have met if I were just going to my class and staying within my circle". Students expressed an appreciation for having a shared space to learn gardening, cooking, and environmental tips from others who "had similar interests".

Several participants discussed how there was something unique about being outdoors in the garden that made it easier to interact with others. For example, Vivika expressed how the garden was more open with fewer distractions, which made her feel more confident talking to and introducing herself to others. She shared:

> "I think the most important thing [I learned], honestly, was just not feeling weird to introduce myself first. . .sometimes it feels really awkward when you're in a situation and no one is really speaking or introducing themselves. But in the garden, that's something I've had to do multiple times. And so, it's just something that is easier and it's kind of nice to know that I am able to facilitate conversations now".

Similarly, a few other volunteers appreciated the opportunity to "connect with people in a low-key, quieter, easier way", which helped promote a sense of community on campus. Several participants also felt a connection to the garden through their "plant buddy". Students were encouraged to connect with a plant and watch it grow over the semester. For example, Aileen discussed why she enjoyed the plant buddy program:

> "I think my favorite aspect of volunteering at the garden is getting to connect with the plants. So, the garden is trying to [have us] build relationships with our plants and our greenery, which is what our ancestors did. And so, taking the time to really sit with plants, using your five senses, smelling or touching, tasting if it's safe to eat and using your eyes just to really observe a plant for more than its face value. And so, it's time for you to really inspect or investigate a plant and find new things about the plants that you didn't know before".

The anticipation and excitement of seeing their plant buddy change and grow over time (e.g., seeing new sprouted leaves or that a creature took a bite out of it) helped students feel an appreciation for nature and a deeper connection to the garden.

3.3.2. Being in Nature

The majority of participants also reported the opportunity to be in nature as an enjoyable aspect of volunteering. It brought students peace and joy to "plant and feel connected to the earth", "get your hands in the dirt and be around living plants", and be immersed in the "greenery". Most students reported mental health benefits from being in nature, stating that they felt "less stressed", "relaxed", and in a better mood after volunteering in the garden. Spending time outside helped participants take a mental break and feel away from academic and work responsibilities. Students mentioned feeling a sense of belonging and a deeper connection to the community and nature, which helped reduce the stress and isolation they felt in the fast-paced academic environment. For example, Bella shared:

> "I think a benefit would be going into a serene and relaxing environment. I feel like when I am surrounded by plants, I feel more relaxed, especially with finals and stuff. So going into a calmer environment I feel is very beneficial to my mental health. I feel like before I started work or before I started volunteering there—I was really stressed out just because of school and stuff. But then I noticed that I started to calm down more when I started volunteering there".

Most participants in the study expressed an appreciation for access to this green space on campus, especially when living and attending school in an urban downtown area. Participants described how it was unique compared to other areas on campus and downtown, with comments such as, "It's really different from the rest of the campus, because there is so much green. It's just a really beautiful place", "When I arrive at the garden, I get to see all the greenery. And when I leave the garden, I feel like I'm back in a very corporate place or metropolitan city", and "It's just a really nice relaxing space to be in compared to [the downtown urban city]". Several students who grew up surrounded by trees and nature appreciated the campus garden as a way to reconnect with natural surroundings and spend time in a familiar environment. For some, moving to an urban

environment created a sense of loss—they felt disconnected from the natural spaces they previously enjoyed. Gardening allowed them to recreate a sense of peace and connection to nature.

3.3.3. Volunteer Challenges

In addition to identifying what participants enjoyed, we also examined the challenges that discouraged sustained participation. More than half of the sample identified time as the most common barrier to volunteering in terms of the availability of volunteer shifts and finding room in their busy schedules. The availability of volunteer shifts directly impacted students, especially if the time conflicted with class, work, or other commitments. Participants stressed the importance of offering volunteer hours on weekends in order to accommodate their busy schedules. Course workload varied within a semester as well as from semester to semester, and, thus, flexibility in volunteer shifts was important in their ability to find time to volunteer. For example, Uma shared why it was hard for her to balance volunteer and school commitments, "It could be somewhat difficult to find time to volunteer. I'm working 15 h and I'm taking 17 units, so I don't always find the time, but I really do enjoy it when I can".

Helping with the compost was another challenge that about half of the participants reported, as it was physically demanding, hot, and malodorous. Participants described the challenges of composting in the following ways: "the smell was unbearable at times", "it's a workout", "really hot", "dirty", and "strenuous". In the same sentence describing the difficulty of managing the compost, students would also include a disclaimer such as, "It's not the greatest, it's not my favorite activity, but I really don't mind getting a little dirty. That's no problem to me". or "It's just heavy, but that's about it. It's not bad in my opinion. I know that other people think it's bad because it smells, but it's not bad to me. It's just like a workout". For example, Chava shared:

> "I don't enjoy turning compost. I don't think anyone really does. It's crazy how hot the compost could get. . .there's a lot of science in it. But yeah, it can literally start steaming. It's really hot. It doesn't smell great. It's definitely not my favorite part, but I don't mind doing it. You know, it's also a lot of work shoveling and stuff like that, but really it's not too bad".

Although managing the compost was challenging, participants described how they were reminded to take breaks and could choose a different volunteer role if they talked with the garden coordinator. Other logistical constraints included transportation, particularly among several students who lived off campus. A few students also noted that weather conditions could make it challenging to volunteer, especially when it was hot, cold, or raining outside.

Despite these logistical and physical challenges, students enjoyed having the opportunity to build connections with diverse people who shared similar interests and spend time outdoors surrounded by greenery when volunteering at the garden. Access to this green space was especially valued when living and attending school in a downtown urban environment. The garden provided a unique opportunity for students to connect with nature and escape the fast-paced, concrete environment of their everyday life—it helped them feel less stressed, put them in a better mood, and provided a sense of being away from academic and work responsibilities.

3.4. Theme Three: Promoting Pro-Environmental Behaviors Through Volunteerism

Participants reported numerous ways in which volunteerism at the garden promoted environmental sustainability. Based on their responses, we identified four themes that represented how the garden influenced pro-environmental behaviors through (1) contributing

to larger environmental efforts, (2) engaging in environmental awareness and activism, (3) adopting lifestyle changes, and (4) applying gained environmental knowledge to their future careers.

3.4.1. Making a Positive Environmental Contribution

First, we found that volunteering provided the majority of participants with an opportunity to make a positive contribution to larger sustainability efforts in the garden, community, and beyond. Every participant in the study described a way that the garden benefited the environment; examples included, "providing a sustainable local source of food for students", "reducing food waste", "keeping native California plants in the area", "promoting habitats for pollinators and other insects", "producing oxygen", "increasing carbon sequestration", and "beautifying the space around us". Helping with the compost, although difficult at times, was also frequently mentioned as a way students could directly see how their small actions contributed to larger environmental benefits (e.g., reducing food waste, mitigating greenhouse gases, enhancing soil health).

We found that students were drawn to this volunteer opportunity because they could directly see the positive impact of their work. Volunteers expressed feelings of productivity during their volunteer shifts because they were actively engaged in completing hands-on tasks such as planting, composting, weeding, and harvesting. Within a single volunteer shift, albeit small, participants could visually see how their hard work made a difference in the garden. Students enjoyed "helping things grow" and seeing the fruits of their labor over time with each successive volunteer shift as they observed the seedling they helped plant eventually transform into a vegetable to be harvested. For example, Domenica shared:

> "At the end of the day, it's like after you finish volunteering and you see the result, you're very motivated and you can see what you did physically, not just academically. So, you have a result. And then even when time passes, if you planted a plant, you can go back to it, even harvest it, which is the best".

Seeing the positive impact of their work extended beyond the garden, as many participants described the sense of purpose they felt knowing that the produce they grew helped the larger campus community. For example, Fai shared how his concern for fellow students who could not afford nutritious meals attracted them to the garden. They decided to volunteer at the garden as a way to help provide nutritious produce to other students, realizing, "if I were to contribute to the community garden, it would be nicer for both the school and also myself". Similarly, Aileen explained:

> "I found it really interesting to see all of the hard work from planting seeds to watching it grow and watering it to being able to harvest fruits and vegetables. And in the end, it was really rewarding to be able to harvest as well as share the produce with the campus community at the food pantry".

Like several other volunteers, Hari expressed why his work at the garden helped him see how even small actions could make a positive impact:

> "...you get to help your community [with clean-up, reducing food waste, and being more resourceful], even if it's in a small way... [I found] small things, even if they don't seem like a big difference, like small things such as being more resourceful, everything matters".

Overall, students enjoyed getting to see the positive impact of their volunteer work in the garden and beyond. They could see how all sustainable actions—no matter how big or small—contributed to a larger environmental movement. Chava summed up this sense of accomplishment best, stating that when one volunteers at the garden, "...you are contributing to something greater than yourself, something that supports the community".

3.4.2. Engaging in Environmental Awareness and Activism

Volunteerism at the garden also promoted increased environmental knowledge, skills, and activism. Every participant in the study shared something new they learned from volunteering at the garden. Some of the most common topics students identified included (1) learning about composting, soil health, and plant growth; (2) understanding sustainability practices and waste reduction; and (3) recognizing the effort required to grow food. For example, Domenica shared, "I learned more about how to deal with native plants or drought tolerant plants and which is better for the environment. You also learn about how to remove weeds or how to compost, which is a huge one". Similarly to other participants, Gabriela described how volunteering at the garden taught her practical skills that she could use at home:

> "[I learned] how composting works, when fruits and vegetables are in season, and some other stuff about plants in general. How sunflowers are spicy so that animals don't eat them before they're completely ripe and have germinated. I thought that was cool. So just general plant facts and how to apply the stuff you learn in the garden at home".

Several students also expressed how the garden coordinator and volunteer staff complemented their learning journey by being extremely knowledgeable, always answering questions, and leading by example. Having the opportunity to undertake hands-on tasks (e.g., planting, pruning, separating seeds, watering, fertilizing, weeding, cutting wood, managing the compost, harvesting produce, and building bug hotels) seemed to make learning about plants and the environment more engaging and memorable for participants. For example, Priyanka discussed why she appreciated the opportunity to engage in hands-on learning through real-world work and how it fostered a deeper understanding of the knowledge gained. "I knew the composting part before, but I saw it live. And then basically how to harvest the plants, how to remove the seeds properly, how to braid the garlic leaves and everything".

A handful of students described how the garden not only "opened their eyes" to broader social and environmental justice issues but also gave them tools and opportunities to get involved in environmental activism. Participants shared how the garden workshops helped them learn more about farm workers' rights, ethical considerations of how farmers are treated, and the importance of learning more about where their food is produced. For example, Euna talked about the value of learning about Indigenous farming, a topic that she might not have otherwise been exposed to, "...Learning about [Indigenous farming], just that exposure to different ways of life or ways of taking care of things that we may not know about or probably not be able to learn in any other capacity". Likewise, Fai provided a powerful example of how volunteering not only made him aware of injustices fava farmers experienced but provided an entry point for broader activism and civic engagement:

> "I think the most important thing I've learned is...that a lot of food is grown through hard work and there are a lot of people out there that have their livelihoods depending on that hard work...We spent a month trying to support fava farmers that are not very attended to—by trying to instate some form of school legislation just to support more community garden efforts...And then we were also trying to promote it on our own social media platforms to say these farmers are in need of support and they should be more valued because we get what they produce and we don't really see how they produce it".

Together, these findings highlight how the garden served as a valuable entry point for getting involved in broader activism. Some students even expressed an interest in continuing to engage in advocacy, policy work, and social justice issues in the future.

3.4.3. Adopting Lifestyle Changes

Based on what they learned and observed at the garden, many students were inspired to adopt more environmentally responsible behaviors into their own lives. Students shared that volunteering helped them "become a lot more conscious of environmental things", "be more mindful of your environmental footprint", and "learn things I can do individually to impact the environment". Several participants expressed how they were motivated to start composting. Seeing the composting process firsthand, as well as having easy access to bring their food scraps to the campus garden, made it easier for students to adopt this lifestyle change. For example, Bella shared:

> "They do compost—helping reduce food waste. Obviously not everybody composts, but knowing that there are people out there that do it, it also influenced me to start bringing in my own food scraps and trying to reduce my own food waste. I feel like seeing the compost puts waste into perspective for me, knowing before I started working in the garden, my food scraps just go in the trash can and that just goes into the landfill. And now knowing it's getting put back into earth by becoming soil, I feel like that's a huge thing that they're doing environmentally".

Participants were inspired to bring their food waste to the garden to be composted as a way to reduce greenhouse gases and food waste in landfills. Some even discussed being motivated to start a compost pile of their own based on their newfound knowledge of how to manage it.

Another common lifestyle change several participants adopted after volunteering at the garden was becoming more conscious of dietary decisions and food production. For instance, Wei shared why she was inspired to eat food that utilized less water after volunteering at the garden:

> "I feel like I go to the garden, and it helps me become a lot more conscious of environmental things. . .So have you ever seen that chart where it has how much water usage for different types of food? I think it was titled "How Thirsty Is Our Food". I just briefly remember someone in the garden bringing it up, and it basically has liters of water required to produce one kilogram of the following food products. I don't know, that was kind of an eye opener for me because Bovine meat is at the very, very top, with over 15,000 L of water required per kilogram followed by nuts and whatever else. And that kind of encouraged me to not eat as much beef or meat in general".

Most participants also discussed a desire to continue gardening, beyond the CCG, as a lifelong hobby they could see themselves sharing with others as a friend, mentor, family member, and potentially parent. Participants discussed how having their own garden would be fun and would be a good place to relax, grow food, compost, and beautify their surroundings—something they looked forward to passing on to future generations. For example, Xenia shared why she was inspired to start a garden one day:

> "It's definitely influenced me to want to have something like that when I have my own house or yard to be able to grow my own food that's not from a grocery store and I can make sure it's safe and everything. And I just think it's pretty sustainable to have your own garden that's clean and you don't have to worry about extra expenses or food waste, because then you could just compost it. I think gardening is a really important thing and it's definitely a hobby that you can have throughout your entire life".

Finally, many participants also described how their experience in the garden inspired them to adopt a variety of sustainable behaviors in their everyday lives. Examples included,

"switching from single use plastics to reusable containers", "using glass jars instead of plastic jars", "recycling more", "using less resources", and "taking the bus instead of driving". Overall, the collective influence of the garden encouraged participants to adopt "little tricks and tips" they could easily incorporate into their daily lives to reduce their environmental footprint.

3.4.4. Application to Future Careers

Volunteering at the garden not only inspired increased environmental knowledge and the adoption of pro-environmental lifestyle changes but also encouraged participants to reflect on how they could incorporate environmentally friendly behaviors into their future careers. Almost every participant in the study described a way they could integrate the knowledge gained from the garden into their future profession. Examples included using animation to advocate for indigenous farmers through storytelling, designing software programs to help farmers, working for nonprofits advocating for environmental justice, and encouraging doctors to advocate for urban gardens as a way to reduce food deserts.

Several participants going into education discussed how they wanted to start their own school garden as a way to teach kids about "how to take care of things", "the importance of growing their own food", "greenhouse gases", "reducing food waste", and "advocating for farm workers". These future educators envisioned connecting the information they learned at the garden into their course curriculum by including more outdoor lessons, teaching children to respect nature, and inspiring the next generation of kids to take care of the planet.

Knowledge gained from volunteering at the garden also provided a few students with more clarity on the types of jobs they wanted to pursue within their field of study. One student, who was starting law school in the fall, described how volunteering at the garden inspired her to pursue environmental law stating, "...what I've learned so far from the events and from the people at the garden, it's given me a small foundation and built my passion for being more sustainable and more environmentally aware". Another student, Uma, who was pursuing environmental studies, described how her experience volunteering at the garden inspired her to want to work with plants and explore how they can be used to reduce greenhouse gases. Similarly, Mira, another environmental studies major, found that she was most interested in waste diversion:

> "... [the compost] it kind of helped me realize that I'm really interested in waste diversion and wanting to reduce the amount of waste that goes into landfills on a bigger scale, on a scale of a whole city or a whole county or a whole state. And so, I think that's kind of one of my ideal career paths would be to work with municipalities to help them figure out a system to collect food waste so that it can be composted and then that compost can be used to fertilize plants in the surrounding areas".

Altogether, our results highlight how volunteering at the garden cultivated change within participants. It gave students new tools, knowledge, and skills to promote environmentally responsible behaviors in their own lives and communities.

4. Discussion

Our findings extend existing scholarship on CCGs by highlighting effective strategies for motivating pro-environmental behaviors among undergraduate volunteers. Specifically, they highlight how academic requirements, personal interests in gardening, and childhood gardening experiences influenced students' motivations to volunteer. Building social connections and spending time in nature, especially when living in an urban area, sustained students' engagement with the garden. Simultaneously, finding time and

physical constraints were identified as challenges to volunteering. Finally, volunteering at the CCG engaged and inspired young people to adopt sustainable behaviors through the development of new environmental knowledge and skills. Volunteering shaped an ongoing interest in environmental and social justice issues as students reflected on ways they wanted to promote sustainability in the future.

4.1. Motivations

This study provides valuable empirical insights into the factors that influence what motivates students to volunteer at a CCG. Although students had the freedom to select where they wanted to volunteer, half of our sample became involved in volunteering as a way to fulfill an educational requirement. Connecting the campus garden to formal educational requirements has been acknowledged in past research as a valuable way to engage students [9,14,15,23]. Our findings complement this research by highlighting the important role faculty play in helping students get involved by requiring students to complete volunteer hours as part of the larger class curriculum. The disciplinary diversity of our sample, with 12 different majors represented among 25 participants, may also speak to the importance of bringing together the classroom and garden, as these types of opportunities may serve as a bridge to get people with varying levels of environmental experience involved.

Furthermore, our results highlighted how volunteering at the garden, for all participants regardless of their initial reasons for volunteering, reinforced what students were learning in the classroom and facilitated a deeper, more meaningful learning experience. Like past research that emphasized the importance of experiential learning [7,15], our results showed students' engagement in hands-on, meaningful work that produced visible, real-world impacts encouraged active participation, practical skill development, and a stronger sense of purpose. Students especially appreciated feeling less pressure from traditional classroom deadlines and rubrics while still gaining new knowledge and skills that complemented their coursework. Together, these findings suggest that connecting educational requirements with volunteer-based opportunities is a valuable and effective means of enhancing learning.

Our results also suggest that childhood exposure to gardening influenced students' re-engagement with gardening as young adults. Almost every participant in the study shared rich childhood memories of gardening with family. Shared childhood family activities, such as gardening, serve as a valuable vehicle for passing down environmental values, skills, and cultural traditions between grandparents, parents, and children. These findings corroborate and extend prior work that shows childhood exposure to nature is important and associated with greater participation in outdoor environments and more pro-environmental values in adulthood [34–37]. However, our findings did not support the idea that campus gardens have the potential to attract a wide range of students regardless of prior experience [7,14], rather, the student volunteers in this study seemed to have an existing interest or background in gardening. Collectively, the results highlight the need for further research to explore the factors that motivate students to volunteer and how prior volunteer experiences or childhood exposure to gardening influences their decision.

4.2. Sustained Engagement

Another contribution of the study is a better understanding of what sustains college students' participation within the unique context of a CCG. Our results showed that building connections and being in nature, especially when living in an urban downtown area, were participants' favorite aspects of volunteering. Similarly, past research shows that community gardens create valuable opportunities for social connection, experiential

learning, and emotional well-being [4,38,39]. Our study extends this research by illustrating how the CCG uniquely supports these same outcomes within the context of higher education. The garden served not only as a learning space, but as a restorative environment that fostered belonging and personal growth—two factors which are critical in sustaining student engagement. These factors are especially important for students navigating the challenges of academic life in an urban environment.

Aligned with past work on CCGs, our findings show that building social connections was especially important to college students [15,23]. Through the campus garden, students formed connections with peers from diverse backgrounds and academic disciplines who shared common environmental interests. Volunteering created valuable opportunities for networking, meeting new friends, and learning from others. Students appreciated having a space to interact with one another in a welcoming, inclusive environment.

Our results contribute to the larger body of research on the social benefits of campus gardens in two ways. First, we found that among the participants who sought out the volunteer opportunity on their own, many did so during their first year or semester on campus as a way to get involved and meet others. Therefore, garden staff may want to actively seek out first year or transfer students when recruiting volunteers in the future to help students get acclimated to campus and make new friendships while learning about the environment. Second, our results showed that students not only socially benefited from meeting other people but also from building relationships with the plants. Students were encouraged to treat their "plant buddy" as they would a domesticated pet and looked forward to seeing how their plant grew and changed each week, which helped enhance engagement and create a sense of belonging. Altogether, these findings highlight how CCGs can strengthen relationships and a sense of community within the university [15].

A second factor that sustained students' engagement with the garden was that they greatly valued the opportunity to spend time in a natural space, especially when living in an urban environment. Interestingly, our interview protocol did not include any questions related to the garden's urban location; participants raised this point unprompted. The garden provided students with a retreat from the fast-paced academic and city life, offering a calming environment that reduced stress, improved mood, and provided feelings of peace. These results align with research on urban gardens that showed access to green spaces in urban environments can significantly reduce stress, enhance mood, and promote overall psychological well-being by offering restorative experiences away from daily academic and city-related pressures [40]. The natural setting also appeared to facilitate more meaningful social interactions, as students felt more at ease, less distracted, and deeper connections through a shared appreciation for the environment. Similarly, research shows that spending time in nature reduces mental fatigue, which in turn, helps one get along better with others [41,42]. In our study, several students discussed how the garden was the only green space they had access to while living in an urban environment, which significantly influenced their involvement. Conversely, a student attending a university surrounded by green spaces may have multiple options, thereby emphasizing the critical role campus gardens serve in promoting nature access at urban institutions. Given the numerous positive mental health benefits of spending time in nature [43,44] and that more than half of the world's population currently lives in an urban area [45], it is especially important for campus administrators to invest in CCGs as a way to promote health and sustainability.

Our findings on participation challenges contribute to the literature on institutional constraints when managing a campus garden by highlighting the specific barriers faced by student volunteers [15,22,23]. Specifically, we found that time as well as completing physical tasks (especially in regard to managing the compost) were the two greatest challenges students experienced. These results suggest the importance of offering flexible scheduling

options to meet the needs of students' busy schedules. Additionally, the physical challenges identified further highlight the need to let students select their own volunteer role as well as market the opportunity to people with varying physical abilities and sensory needs to ensure everyone feels included and welcome. It is important to note that we captured challenges that volunteers experience compared to non-volunteers, and, thus, future studies may want to further investigate additional barriers that dissuade students from volunteering at the garden. Overall, these findings complement existing studies by providing in-depth examples of what sustains student engagement but also extends the literature by highlighting real-world challenges that impact student involvement.

4.3. Campus Community Gardens as Sites for Promoting Pro-Environmental Behaviors

Finally, we found that volunteering at the CCG promoted both pro-environmental knowledge and behaviors. Like Rohmah et al.'s (2023) systematic review, our results highlight how volunteering at the garden helped college students transform their pro-environmental attitudes into more sustainable behaviors in several key ways [28]. First, our results align with previous findings suggesting that college students demonstrate greater motivation to participate in a potential campus garden when the tangible benefits to the broader community are evident [14]. Our results reflect this and offer insights into the tangible benefits derived from volunteering at the garden, as students felt a sense of purpose not only from completing hands-on tasks at the garden but also from having the opportunity to make a positive contribution to something larger than themselves. Seeing the impact of their work at the garden (e.g., helping plants grow, getting to take home harvest), on campus (e.g., contributing to the student food pantry, beautifying campus areas), and in the community (e.g., reducing food waste, advocating for environmental and social justice issues) empowered students to want to continue contributing to ongoing environmental efforts.

Second, volunteering at the garden also broadened students' environmental knowledge and understanding. Participants appreciated learning from the garden staff, who regularly shared their expertise, working with other students who shared gardening knowledge, and observing the garden itself as a model of sustainability. The garden also frequently brought in guest speakers, hosted environmentally themed workshops, and organized events to encourage activism, which increased awareness of both environmental and social justice issues. This finding is consistent with past research highlighting how educational opportunities can increase sustainability awareness [8,9,14,15]. Furthermore, involvement at the garden also provided an entry point for helping students get involved with activism through writing letters to school administrators, sharing information on social media, and connecting with local community organizations. Collectively, the results highlight how one's social environment can strengthen pro-environmental attitudes [28] and that directly experiencing an environmental issue has a stronger influence on people's behavior than indirectly learning about the problem [25].

Third, our results suggest that the garden's collective cultural influence, combined with students' increased environmental awareness, inspired many participants to adopt pro-environmental behaviors in their everyday lives, including composting, reducing food waste, making dietary changes, and using fewer resources. Students' easy access to the inclusive CCG made it easier for them to adopt environmentally friendly behaviors. This support occurred across multiple areas: physically, through convenient access to composting and sustainable food; socially, through influences from role models, guest speakers, and peers with similar interests; and cognitively, through a deeper understanding of environmental issues. Similarly, others have found that having the necessary infrastructure makes it easier for people to adopt pro-environmental behaviors [25]. Together, these findings also

align with research on the environmental attitude–behavior gap in that students may be more willing to adopt new pro-environmental behaviors when the cost is low and of minor inconvenience [27,46]. Thus, campus gardens can help facilitate pro-environmental behavior changes through a collective cultural influence, increased environmental awareness, and by providing accessible resources to students and the larger community.

Finally, beyond the short-term pro-environmental benefits, our results also suggest that students will continue to apply sustainable practices in their future work. This result is consistent with past work that showed engaging in experiential learning can be a transformative experience that inspires students to become more involved in agricultural occupations [7]. Our findings extend beyond agricultural-type occupations in that every participant, regardless of major, shared a concrete way they could promote sustainability into their future career across many different occupational areas, including teaching, storytelling, activism, and service to the community. Some were even inspired to pursue environmentally focused careers within a larger field of study. Overall, the garden volunteer experience cultivated change within participants—giving young people new tools, knowledge, and skills to promote pro-environmental behaviors in their own lives, communities, and beyond.

4.4. Limitations and Future Directions

Alongside opportunities for future research, several limitations of the study should be taken into consideration. Our non-probabilistic purposive sample risks self-selection bias in that people who volunteer at a CCG may already have a strong interest in environmental issues, and thus be more likely to adopt new environmentally friendly behaviors. Future studies may want to compare different sustainability initiatives on campus and see which ones are most effective in encouraging pro-environmental behaviors (e.g., volunteering at the garden compared to taking a class on gardening). Alternatively, future scholars might consider investigating a course that requires volunteer hours, comparing students who volunteered at the garden with those who engage in another type of environmentally focused community organization to determine which setting is more effective in promoting pro-environmental behaviors.

Another limitation of the study is that we did not take into consideration the total number of hours volunteered in our analytic process. Volunteers who completed more hours may have benefited more than those who volunteered fewer hours. For example, past studies on fruit and vegetable intake found that the frequency of gardening was associated with a sustained benefit [17,18]. Thus, future studies may want to consider the frequency of hours volunteered and outcomes achieved to help inform recommendations for sustainability-focused initiatives.

Lastly, the majority of our sample was in their final year of study. Past research shows that years of study matter, and students who have completed more years of education tend to have greater environmental knowledge than first-year students [25,26]. Therefore, our sample may have had greater environmental knowledge going into the study, making them more likely to adopt new pro-environmental behaviors. Given that several of our participants began volunteering when they were new to the university, it would be interesting for future studies to track environmental knowledge and behaviors gained over time in a longitudinal study. They also might want to compare the benefits and constraints of participation for first-year students to fourth-year students to inform future garden programs.

5. Conclusions

Overall, the findings of the study meaningfully contribute to the broader sustainability literature by suggesting that volunteering at a CCG has the potential to promote pro-environmental behaviors within higher education institutions. For educators, the findings highlight the important role faculty play in helping students get involved with the garden. Connecting classroom requirements to garden volunteer opportunities can help enhance students' sustainable knowledge through hands-on experiences. Simultaneously, the findings encourage administrators to invest in CCGs, especially on urban campuses. Our results suggest that access to a community garden provides students with a myriad of meaningful benefits. These include opportunities to build social connections, improved access to green spaces that promote mental well-being, and involvement in a community that both culturally and practically promotes sustainable behaviors. Furthermore, the garden's infrastructure encourages environmentally responsible practices, making it easier for students to engage in pro-environmental behaviors in their daily lives. Through the inclusion of student voices, we gained deeper insights into why college students were motivated to volunteer, what sustained engagement looked like, and how volunteering at the garden supported the adoption of pro-environmental behaviors.

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Abbreviation

The following abbreviation is used in this manuscript:

CCG Campus community garden

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