

Title: School gardens: Impacts on high school students and establishing community partnerships

Introduction: The future of agriculture faces significant challenges. Roughly one in seven people lack access to food or are chronically malnourished and environmental issues, such as climate change, biodiversity loss, and the degradation of water and land resources, are threats to future production (Foley et al. 2011). These are growing concerns as the growing urban global population becomes increasingly disconnected from food production—leading to the expansion of production practices that degrade the environment, public health, farmer rights, and social relationships.

Urban food movements are a means of combating the environmental and social harms of the current food system. Recentering food production in localized urban food systems helps reconnect urban consumers to their food and provides an alternative to conventional food supply chains (Diekmann et al. 2020). This can take place in many ways, including direct markets and community gardens, such as those found in schools (Diekmann et al. 2020). Having access to a school garden increases students' daily contact with nature and the process of growing food (Huys et al. 2017). School gardens are an accessible venue for reaching children, who are an important audience since their experiences with nature will shape future urban development, relationships with the environment, and consumer purchasing habits (Fischer et al. 2019). School gardens are also an opportunity for teachers to extend classroom curriculum into a real-life setting for concepts such as food production and water conservation (School Gardens).

However, there has not been widespread implementation of school gardens. Although resources such as the California Regional Environmental Education Community (CREEC), A Blueprint For Environmental Literacy, and the California Education and the Environment Initiative exist and would align well with supplementary lessons in a garden, only a small portion of mandatory California state curriculum addresses the human impacts on the environment. In fact, the word "agriculture" only appears once in the *Next Generation Science Standards for California Public Schools, Kindergarten through Grade Twelve* (CA NGSS).

Although prior studies have identified the impacts of school gardens on health, nutrition, and academic performance, my study will focus on identifying the specific impacts that gardens have on students' decisions outside of a classroom environment. A key focus of my research will be how increasing awareness of food production starting from a young age can help foster a generation that makes better food purchasing decisions by reconnecting them with how food is grown. These findings could also be motivating factors that push potential partners to invest resources into implementing gardens.

Time, staff, funding, curriculum, and space have been found to be major barriers to implementation (Burt et al. 2018). Connecting schools and community partners with resources could help schools start and maintain gardens as part of their curriculum (Burt et al. 2018). However, different types of partners, such as universities, nonprofits, and corporations, have varying resources to offer. Understanding which partnerships are most beneficial for specific community needs could ensure that partners are building the most beneficial community ties.

My study will seek to identify how school gardens impact high school students' long-term food purchasing choices. These impacts can then be used to further motivate potential community partners to work with schools on the implementation and maintenance of school gardens.

Research Questions: 1) How does having a school garden affect high school students' long-term food purchasing choices outside of school and their understanding of the food system? 2) What are the most beneficial kinds of partnerships to support the specific needs of schools in implementing a school garden?

Research Design:

Aim 1: *At schools that have successfully implemented school gardens or farms as a part of their curriculum, assess if a garden impacts high school students' long-term food purchasing choices and views of the food system.* This will be a longitudinal assessment of high school students who attend schools that have implemented a school garden. Students will be asked to complete a survey when they attend their first garden lesson or activity. The survey will include multiple choice and linear scale questions about the student's and their family's current food purchasing habits (where they buy their food; what they look for when choosing what to buy), their level of connection to the food system (if they know where their food is sourced from; if they know who grows their food, how it is grown, and what methods are used to grow it), and their own involvement in food production (if they have grown their own food before; if they are interested in growing their own food). The survey will also ask for a student's zip code and general socioeconomic information to help control for differences in availability and access to locally grown foods, farmers' markets, and income. At the end of the school year, the same students will be given the survey to see if there are any changes from their initial responses. Survey responses will be used to identify any behavioral changes over the year-long course of exposure to a school garden curriculum.

Aim 2: *Identify the ability of different types of partners to address previously identified implementation barriers.* Based on previously identified barriers to implementation (time/staff, funding, curriculum) and types of community partners (non-profits, academic institutions, and companies), this study will pair schools and partners together (Table 1). Each of these pairs will serve as a case study for how well a specific type of partner meets the specific needs of a specific type of implementation barrier. For each type of pair, there will be three replicates to control for variation within schools and partners. A survey will be given to each party at the beginning of the partnership to determine what each party hopes to gain out of the partnership. After a year-long partnership, another survey will be administered to see if these goals were fulfilled and what was lacking in the partnership. These surveys will provide qualitative feedback that can be used to create a framework to guide the establishment of future partnerships.

Intellectual Merit: This work will fill gaps in the field's understanding of how having a school garden can impact student choices and decision-making beyond the classroom, which is important since they are the next generation of purchasers, consumers, and leaders. Prior studies have looked at the academic and health benefits of school gardens, but the questions asked in this study's survey will focus on how their experiences can shape more environmentally and socially sustainable choices. Furthermore, understanding what kinds of partnerships are the most helpful

for overcoming known barriers and how to initiate such partnerships will aid schools in implementing and executing school garden curriculum.

Broader Impacts: By 2050, the majority of people will be living in urban areas, which means that food production and consumption habits by those residents will be the major driver of agriculture and its impacts on the environment and producer livelihoods. This study will identify the impacts of school gardens specific to purchasing and lifestyle decisions, which will extend well beyond the classroom. A stronger understanding of partnership dynamics can also help organizations, institutions, and companies interested in using their time and financial resources to make a direct impact on the community. Measuring shifts in consumer purchasing habits and follow-up surveys with participants and partners from this study could be helpful for tracking these impacts in the long run.

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