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## Biology 4920G: Companion Planting in the Community

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Community Engaged Learning Partnership with LIFE\*SPIN

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## **Part 1: LIFE\*SPIN Deliverables and Efforts**

For the Community Engaged Learning (CEL) project for Biology 4920G: Seminar in Biology, I worked with classmate Maria Bata as we partnered with the organization Low-Income Family Empowerment\*Sole-Support Parent Information Network, or LIFE\*SPIN. LIFE\*SPIN is located on the east end of London and aims to bring low-income families out of the poverty cycle. By providing resources such as income tax-filing clinics, youth programs, legal education, and more, LIFE\*SPIN encourages sustainable living and self-sufficiency amongst their clients with low-income.

Maria and I worked directly with LIFE\*SPIN's founder Jacqueline (Jackie) Thompson and Myrna Pronchuk to plan LIFE\*SPIN's 'Seed Planting Party' scheduled for the afternoon of March 18<sup>th</sup> at the LIFE\*SPIN office. This event entailed children participating in planting seeds into pots, storytelling, craft making, and snacks. Overall, this would be an educational day during March Break for at-risk children to learn about the importance of planting seeds early, where their food comes from, and nutrition basics. In addition to gaining leadership skills, children would become more aware of healthy food, anthropogenic impact on the environment, and improved social skills.

In order to engage Maria and I into the planning for this educational event, LIFE\*SPIN entrusted us with responsibility of researching companion planting, planning the layout of the garden, preparing a seed list and equipment list, planning crafts, planning/setting up/attending the event, and cleaning-up after the event. As LIFE\*SPIN has a fairly large garden, Maria and I were responsible for designing a 14-plot garden with a variety of compatible plants that would be planted in May and harvested in the latter-half of the summer. We were also tasked with gathering the craft materials and preparing examples, however these tasks were not biology-

related and required substantial time and effort beyond the responsibilities in our LIFE\*SPIN contract. Prior to the COVID-19 pandemic shutting down the university and non-essential businesses, Maria and I completed the companion planting research, planned the garden layout, prepared the seed list, filled pots with soil, and assisted in planning crafts.

We attended multiple meetings with leaders at LIFE\*SPIN and previous Seed Planting Party volunteers to discuss supplies, responsibilities, and the event schedule. The main challenge with designing a 14-plot garden was optimally positioning plants to enhance the harvest, rather than discourage the growth of one another. We initially went through the seed inventory at the LIFE\*SPIN office; this task informed us of which seeds were heavily used last year (their packages were often nearly empty), and which seeds were rarely used (their packages were often full of seeds). Next, we researched the companion plant relationships amongst common garden vegetables and fruits by consulting research articles and gardening websites. We additionally consulted with LIFE\*SPIN volunteers well versed in horticulture and gardening to learn which plant varieties have been used in the previous years of the Seed Planting Party event. Additionally, Maria and I filled planting pots with soil for children to place their seeds into.

In terms of dividing the responsibilities between Maria and I, we both consulted many research articles and gardening blogs to establish which plants would encourage each other's growth when positioned next to each other to enhance the yield. I designed the schematic of the garden plots illustrating positioning of focal plants and a mind map illustrating the companion relationships amongst the selected focal plants. Maria constructed a document describing which focal plants we selected for the garden, what plants they are compatible with, and additional notes about seasonal varieties and growing conditions. As another responsibility outlined by LIFE\*SPIN was to plan crafts for the children, Maria and I compiled a list of simple garden-

themed craft ideas. These crafts included homemade suncatchers, painting rocks, bookmarks, vegetable gardens, and caterpillars made of rocks. Ultimately, we were assigned a wide variety of tasks and completed all of the preparation-related tasks and the remaining tasks were to be conducted on the event day.

## Part 2: Companion Planting

Companion planting is a pesticide-free practice where specific plants are positioned beside a focal plant to benefit each other. For example, parsley discourages aphids from damaging collards, thus it'd be beneficial to plant together (Saldanha et al. 2019). This practice tends to result in higher crop production and less insect pests amongst crops (Hinds et al. 2016; Kapoulas et al. 2017). Companion planting is important for effective garden design in optimizing plant yield, shown in studies demonstrating enhanced focal plant growth when companion plants are intentionally grown with them because they prevent pest infestation, rather than ineffectively plant these companion plants later to reduce the infestation (Conboy et al. 2019). Practising companion planting enhances yield by reducing damage from pests, enhancing soil conditions, and providing physical support.

Companion planting reduces pest issues and attracting beneficial insects to increase crop production. Companion planting reduces damage and growth interference from pests by repelling pest insects. Planting French marigolds beside tomato plants is beneficial for tomato plants because they emit limonene, a chemical that suppresses the growth of adult whitefly (*Trialeurodes vaporariorum*) populations who are parasites to tomato plants (Conboy et al. 2019). Planting chives next to strawberry plants is an effective pest management tool for optimizing yield (Hata et al. 2018). Surrounding focal plants with companion plants that pests cannot tolerate, the focal plant can grow without pest interference. Companion planting attracts beneficial insects that can kill pests. The 'attract-and-kill' method lures natural enemies of a pest to a companion plant, and when the pest is present, the natural enemy kills them to prevent damage to the focal plant (Vernon et al. 2016). For example, companion planting mint plants can attract predatory mites to attack pests (Togashi et al. 2019). These trophic interactions act as a

natural pest suppression strategy, encouraging the growth of both the companion and focal plant. While companion planting can change the dynamics of the biota in the aboveground environment by discouraging visits from pests and encouraging visits from beneficial insects, this strategy can also encourage changes in the belowground biotic processes.

Practising companion planting improves soil fertility which directly influences crop yield. Companion planting can directly enhance the growth of other plants while indirectly altering the soil microbial environment. Companion cropping cucumber with wheat plants increases the diversity of the microbial community, feeding back into the enhanced growth of cucumbers (Chang et al. 2017). Enriching the soil fertility by diversifying the belowground community through companion planting increases crop production. Some plants can fix atmospheric nitrogen, an important element in plant growth, and provide this nitrogen to plants containing limited nitrogen. Interplant transfer can occur when a nitrogen-fixing companion plant donates nitrogen to another living plant that has a lower concentration of nitrogen and cannot fix nitrogen (Yong et al. 2015; Dollery et al. 2018). These nitrogen-fixing plants contribute to a balanced soil environment important for the productivity of crops. Even if the above- and belowground environments are balanced with proper nutrient cycling and biotic communities, the vegetation should be protected for optimal crop production.

Physical protection associated with companion plants enhances crop yield. Companion plants physically protect focal plants from damage. Natural shelters, such as those generated by intercropping, can interrupt the movement of plant enemies and consequences of microclimate (Kishinevsky et al. 2017; Gontijo 2019). The physical companion plant can act as a border around the focal plant and provides protection against damage occurring due to insects and harsh weather conditions, encouraging normal growth in these focal plants. Companion plants can act

as physical supports to aid the growth and development of focal plants. Corn can act as a trellis for pole bean vines to climb (Small 2017). Companion plants can act as natural support that enhances a focal plant's exposure to sun and precipitation, and its own physical development. Ultimately, in combination with legumes being nitrogen-fixing plants, both plants receive support from one another to contribute to one another's overall yield.

This practice of pairing plants to enhance crop yield keeps crops heterogeneous by minimizing pest damage, diversifying the belowground environment and keeping nutrients cycling, and supporting the aboveground vegetation from physical damage. Companion cropping provides season-round benefits to plants to increase yield without the use of chemicals.

### **Part 3: Reflection**

Working with LIFE\*SPIN for this CEL project had an overarching lesson about the complexity but also rewarding aspect of teamwork. My interactions with LIFE\*SPIN were constantly evolving as we became more acquainted with staff and volunteers and more aware of how LIFE\*SPIN delivers their overall goals to their community. Our initial meeting with LIFE\*SPIN introduced us to Jackie and Myrna, and subsequent visits to the organization's office introduced us to the other passionate staff, volunteer student nurses, and volunteers from the community. Through these interactions, I observed the diverse group of unique individuals who come together to carry out meaningful community-based events and relationships.

Maria and I worked exceptionally well together as a team because we effectively communicated, entrusted one another, and were adaptable. Prior to each LIFE\*SPIN meeting, Maria and I discussed what information we needed to gain at the meeting to complete our responsibilities and debriefed after the meeting to discuss how we would utilize this information. With each responsibility, Maria and I divided it into smaller tasks; we trusted that both of us would complete their section by the deadline to submit our work as a team. In doing so, we respected each other's schedules by giving each other ample time to complete our tasks while offering assistance to each other. We also balanced out each other in terms of strengths and weaknesses, contributing to our overall excellent team dynamic.

I observed both academic and personal growth throughout this CEL project in presenting biological research to a real-life scenario and communicating with a large team. For most biology classes, primary article-based research is rarely translated to a tangible, real-life scenario, and rather transferred into a written paper that a couple individuals read. This CEL project required considering what this research was for and the parameters (ex. Size of the

garden, local climate, child-friendly seeds) for selecting plants for a real-life garden that individuals from the community can enjoy. Additionally, I often prefer to work independently on projects, and this can be both a strength and weakness. This experience has shown the intangible beauty of individuals with diverse strengths working together as a team.

This experience explored the importance of education in bringing families out of the poverty cycle – of which I am incredibly enthusiastic and passionate about. Unintentional as it was, our meetings at LIFE\*SPIN coincided with client visits and I often overheard them explaining the reason for their visits. This added a whole new dimension to this project that ultimately deepened my passion for this topic; it further developed my empathy, helped recognize my class privilege, and advanced my comprehension of why active organizations like LIFE\*SPIN are incredibly vital to the functioning and survival of lower-income families.

We worked closely with Myrna, who gave us clear instructions to complete tasks, and encouraged open dialogue for concerns and suggestions. Jackie was present at most meetings, explained the available resources for the event, and provided a full tour of the entire organization grounds. This tour illustrated their daily servitude to the community through long-term resources (such as their free store, bookstore, garden) that low-income families can afford and trust. LIFE\*SPIN has an incredible variety of volunteers who uniquely specialize in their own interests to serve the local community. From interacting with a volunteer who is a gifted storyteller, to another volunteer who is passionate for botany and experienced in this field, I recognized the incredible skill set present at LIFE\*SPIN, and the need for a diverse range of skills in all team settings.

Planning and preparing for the event strengthened my desire to work with lower-income communities and make healthcare accessible to all communities. Staff and volunteers at

LIFE\*SPIN are driven by their genuine care for all people, and use this drive to tackle the complex cycle of poverty. I have been inspired by this collective drive to motivate my pursue of higher education and eventually work in the healthcare system. Additionally, as the COVID-19 outbreak intensifies, LIFE\*SPIN continues to serve their clients remotely and provide guidance on resources such as how to access federal benefits, income security support, mental health support, and much more. The work at LIFE\*SPIN does not stop when an outbreak occurs because this is when low-income families rely on organizations like LIFE\*SPIN the most. It has been my pleasure to serve at LIFE\*SPIN, and this experience will continue to motivate my goal of working in the healthcare sector to serve lower-income communities.

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