



SP0176 Final Report

Please answer the following questions and return the completed form to the [SPF Staff](#) via e-mail.

Project Title: Autonomous Controlled-Environment Growth Chamber Display

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Actual Project Start Date: [Click here to enter a date.](#) **Actual Project End Date:** [Click here to enter a date.](#)

1. Please summarize the project and its key accomplishments in 1-2 sentences.

(400 characters maximum)

The project's aim was to produce an educational display to showcase new agricultural technologies in a museum setting. This project accomplished its aim, through the creation of a growth chamber that is able to autonomously produce lettuce, while providing an interactive visual element that will provide for many educational opportunities.

2. Your team listed the following goal in your application:

Create an autonomous controlled-environment food production system that will be displayed at the Macdonald Farm Community Engagement Centre

Did your team achieve your project's goal? In your answer, please describe the impact your project had on McGill's structures, processes, and/or systems. Also, please specify how this positively transformed people's behaviors/perspectives/habits on McGill campus(es).

(Unlimited characters, suggested minimum ½ page or approximately 250 words)

The team has accomplished the goal in respect to the creation of the food production system. While the Macdonald Farm Community Engagement Centre remains under construction, the department of Bioresource Engineering will be displaying the chamber on campus until the Community Engagement Centre is complete. Throughout the duration of the project, the project succeeded in creating a conversation about sustainability projects on campus. As the display was a large and eye-catching item at the machinery shop while under construction, many students inquired about the project; its purpose, the details behind it, and how they too could get involved or start a project of their own. Many students already interested in new food production technologies with unrealized ideas, were given a direction for which they could start their own projects, whether through the Sustainability Project Fund or alternative sources.

3. Please describe the key successes and challenges of your project. (Minimum of two examples for each)

(Unlimited characters, suggested minimum ½ page or approximately 250 words)

The team faced many challenges over the course of the project.

The largest challenge time management and planning, as several objectives took much longer than anticipated, pushing the timeline back. As there was no existing documentation for construction, some design challenges were encountered that took time to overcome. Managing the project during the academic year proved challenging, and when the project ramped up over the summer, delays were experienced as certain parts of the project took longer than others. The hydroponics component was reworked several times, to ensure that water flowed evenly and would not splash on the electronic components.

Another challenge was the team involvement. At the project's conception, there was an expectation of weekly meetings and frequent follow-up with the supervisor. Due to members' additional commitments, this became

difficult and hampered project progression. Halfway through the project, a core team member left as they had graduated and become employed. Additionally, the team found it difficult to receive support and guidance from the project's supervisor, leaving them to face problems that could have been avoided and overcome them on their own. In reflection, the project could have benefited from being more intertwined with a club, though the members who submitted the project application were not members of any clubs at the time. The students who worked on the coding portion also became too heavily involved in other clubs and schoolwork to commit time to the project, and without the supervisor to check in on progress, the project took longer than expected and suffered from a lack of involvement.

Despite the challenges there were many successes of this project. The design and construction of the prototype itself was huge success. The red-blue LEDs emit a neon pink glow from the chamber and draws a lot of attention from passers-by. Use of the recycled display-fridge as a frame provided an ideal framework for the controlled environment and allowed ample growing area while reducing the need to use new materials for the construction. The linear motion system was a clean and efficient way to execute the motion of the arm and ended up being one of the most interesting systems in the prototype. On another note, the core team made had many successes; from learning new skills, improving communication and problem-solving skills, and has passed on the lessons they learned to fellow students and projects on campus.

The project has garnered lots of attention at the Macdonald Campus, with many students eagerly awaiting their first sample of lettuce from the chamber.

4. What key points of advice or *lessons learned* would you give to other SPF teams either regarding your experience managing your project or the project itself?

(Unlimited characters, suggested minimum ½ page or approximately 250 words)

- Start with what you feel will be the most challenging aspect of your project and try and solve it first, or as soon as you can. Delaying the solution to that problem may mean you will have made your problem even harder in the long run.
- Try to consider the many roadblocks which will present themselves over the course of the project and plan for accordingly on the timeline. It is better to overestimate the hours required than underestimate
- If you are engaging members beyond the core team of your project, ensure they have a clear understanding of their expected tasks and roles in the project, as well as the timeline.
- Ensure your supervisor will be committed to providing help when you need it, and make sure they have enough time to help.
- If you begin hitting roadblocks in your project reach out the SPF teams and any other mentors or supervisors early. They can help you get back on track, and the earlier the better. These people are here to help you and it is okay and advantageous to ask for help.
- Schedule weekly or bi-weekly meetings with team and mentor/supervisors to help keep everything on track. This will allow you to touch base with the timeline and tasks everyone is working on, showing any weak spots in the plan.

5. What recommendations do you have for the future of this project to be continued and are there any opportunities for complementary projects? Who will take responsibility for the project's future and how can interested persons be in touch? The SPF team will also be in touch with this contact for updates on the project's progress in coming years, if ongoing.

(Unlimited characters, suggested minimum 1 paragraph)

This project can be used as a framework to integrate further technologies, such as machine vision and artificial intelligence to display the continued evolution of agricultural technology. Leftover materials from the project can be used to create supplementary exhibits of hydroponic technologies very quickly. Clubs on campus such as the permaculture club could work with the project to introduce some of the technologies into their own club's projects. This project was originally intended to be placed into the responsibility of the Community Engagement Center, but

as its construction is behind schedule the Bioresource Engineering Department will be taking responsibility for the interim. Undergraduate volunteers will be enlisted to maintain the machine weekly. The undergraduate student volunteers will be determined once the project is in its final position.

6. Would you or your project team member(s) be willing to serve as a mentor to SPF project teams?

Please choose one. If yes, SPF Staff will contact you with more information. (800 characters maximum)

Yes No

This project has been a great opportunity to learn about self-governing a project on a large scale. I would be willing to meet with any undergraduates taking on large projects for the first time who may need insight, and offer suggestions and warnings.

7. In your application, you listed the following sources of funding: N/A

Please confirm if you received this funding in the space below. In your response, please list the actual amount (in dollars) that you received. Note: If you received funding from a McGill Department or Unit, please attach a letter from its Financial/Budget Officer confirming the actual amount of support.

(1,800 characters maximum)

8. Did you purchase equipment or make an installation on campus? Yes No

If yes, please briefly describe how these items will be maintained and used in the future.

(1,800 characters maximum)

This project is to be installed on campus. Currently the location is unknown as the initial plan was to install it in the community engagement center which is to be constructed. The Bioresource Engineering Department will maintain the project until the installation can be moved to the CEC. Due to the expensive nature of some of the parts (Touch screen computer used as a screen) it is not advised to put the machine in a location with unrestricted access. This may provide some difficulty in determining an ideal location.

9. The following Key Success Indicators were indicated in your project application and selected for tracking. Please indicate the actual results that you have achieved in the "Actual" column.

Selected Key Success Indicators	Target	Actual
# of partnerships formed with student groups using food on campus	2	1
# of surveys completed testing visitor knowledge before and after visit	25	N/A
1 operations and maintenance manual created	Complete	Y

If there is a significant difference in the target numbers and the actual numbers achieved, please explain. If you have any additional information to share about these success indicators, please also include it below.

(1,800 characters maximum)

A partnership was made with the Mac Campus Robotics Club. There are intentions to form another partnership with the Out of the Garden Pub (OGP) project, although they will not be returning until September. Up until now partnerships have not been made as the project is not yet producing any lettuce for them to use. Upon the return of the school year a partnership will be discussed.

10. Please report on your results for the standard SPF Key Success Indicators in the “Actual” column.

Standard SPF Key Success Indicators	Actual #
# of volunteers directly or indirectly engaged in the project	TBD
# of people (student, staff, or other) trained in the context of the project	5
\$ raised for project activities subsequent to SPF funding	0
# of partnerships or collaborations developed between the project team and other McGill administrative units, student groups, community groups, other universities, and/or other groups/organizations.	2
# of tons of GHG emissions reduced by your project	N/A

Regarding the last Key Success Indicator, please list the groups and/or organizations that you counted.

(Unlimited characters; point form acceptable.)

Mac Robotics Club, Biomass production lab, Precision Agriculture and Sensor Systems Lab

If you have any additional information to share about the Standard SPF Key Success Indicators, please include it below. (1,800 characters maximum)

11. Please indicate the McGill stakeholder groups that were involved with your project as a team member or collaborator/partner. Choose all that apply.

- Undergraduate
 Postgraduate
 Administrative Staff
 Academic Staff
 Alumni

12. Please rate your project team’s overall satisfaction with the support provided by the SPF Staff. Choose only one response.

- Very Dissatisfied
 Dissatisfied
 Neither Satisfied Nor Dissatisfied
 Satisfied
 Very Satisfied

13. Please provide any feedback or recommendations regarding your team’s experience with the SPF.

(Unlimited characters, suggested minimum 1 paragraph)

The team was very supportive throughout the whole project. Shona and Krista were very understanding throughout out time delays and helped to ensure the team felt supported and helped to remind all groups involved of their commitment to the project.

14. If there is additional information you would like to share about your project, please use the field below.

(Unlimited characters)

We hope this project can be used as a learning experience to any future projects with similar objectives. The finished product will be of great benefit to the McGill community, however there are certainly many lessons that can be learned from the development of this project. Ensuring that there is sufficient followup and communication between supervisor and the team members is important in ensuring the project moves forward in a timely manner with minimal delays.

15. Has involvement in this SPF project positively impacted your team in the area of professional growth?

Please choose one. If you would like to elaborate, please use the field below. (800 characters maximum)

- Yes
 No
 Prefer Not to Share

This project has allowed us to gain many new skills, both soft and hard, and lessons which will be applicable in the workforce. From working with a self-governed team to managing a realistic timeline these soft skills will be incredible useful in professional settings. The innumerable hard skills used will increase employability as well as

increase confidence for capability in future projects. This project likely provided more usable experience than any other activity

16. Has involvement in this SPF project positively impacted your team in the area of personal growth?

Please choose one. If you would like to elaborate, please use the field below. (800 characters maximum)

- Yes No Prefer Not to Share

This project has been a challenge which pushed the team members and showed both strong and weak points in each persons abilities.

17. Which of the following skills or attributes has your team improved through involvement in your SPF project? Choose all that apply.

- | | | |
|--|--|--|
| <input type="checkbox"/> Budgeting | <input type="checkbox"/> Networking | <input checked="" type="checkbox"/> Systems Thinking |
| <input checked="" type="checkbox"/> Communications | <input checked="" type="checkbox"/> Planning | <input checked="" type="checkbox"/> Teamwork |
| <input type="checkbox"/> Conflict Resolution | <input checked="" type="checkbox"/> Problem Solving | <input checked="" type="checkbox"/> Technology |
| <input type="checkbox"/> Leadership | <input checked="" type="checkbox"/> Project Management | <input checked="" type="checkbox"/> Time Management |
| <input type="checkbox"/> Listening | <input type="checkbox"/> Public Speaking | <input type="checkbox"/> Writing |
| <input type="checkbox"/> Mentoring | <input type="checkbox"/> Stakeholder Engagement | <input type="checkbox"/> Other (Please specify in the field below) |
| <input type="checkbox"/> Negotiating | <input type="checkbox"/> Stakeholder Identification | |

Other:

18. Since starting your SPF project, has your team improved its knowledge of sustainability?

Please choose one. If you would like to elaborate, please use the field below. (800 characters maximum)

- Yes No Prefer Not to Share

Taking on this project made us aware of the cost and difficulties associated with implementing sustainable practices and/or solutions. While the end result of sustainable measures has great benefit, the development and planning of the finished product must consider many factors so that it is also achieved in a sustainable way.

further increased our awareness of the great cost and innaccessibility of food in remote locations. Although this technology is not a complete solution, it opens up a discussion about local food production in remote areas.

19. (Optional) If applicable, please list the total number of team members voluntarily self-identifying as members of marginalized communities:

Please identify the represented communities below. (e.g. women, Indigenous people, people of colour, LGBTTQI, student parents, members of ethnic minorities, immigrants, people with disabilities)

(1,800 characters maximum)

Thank you for completing your Final Report!

Please e-mail your report to the [SPF Staff](#) attaching any additional information that you would like to share about your project (e.g. other reports, research, documents, photos, etc.). Please note that this Final Report will be shared publicly on your SPF project's webpage.

