



**Lafayette College Technology
Clinic: Final Report, Fall 2014**

Cultivating Ideas, Habits, and Seedlings

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Project Summary

Over the past three seasons, the Lafayette Technology Clinic has worked with the Bangor Area High School to help get the greenhouses on campus up and running. We have worked with students, faculty, administration, and community members to develop projects, curriculum, and resource contacts in an effort to create a self-sustaining program for students at the high school. Programming was created that encourages nutrition and healthy lifestyles among teens as well as support agriculture as a staple of the Bangor Community. The work culminated in a condensed informative project manual that provides resource contacts, project instructions, and a suggested pathway towards the greenhouse sustainability.

What is Technology Clinic?

The Technology Clinic is an academic program that engages a small group of students, nominated by professors and facilitated by two Lafayette College faculty. Over the course of two semesters the Technology Clinic team works together on imaginative solutions to real-world problems presented to the team by clients. Each team is interdisciplinary, with members selected from sciences, social sciences, engineering and humanities. Since the Technology Clinic's founding in 1986, the course has offered its participants rewarding experiences through projects that emphasize problem-solving and consulting skills.

Meet the Team

- ❖ **Rachel Barron ('16)** is a junior from Auburn, NY. She is double majoring in Biochemistry and Environmental Studies. At Lafayette, she is the recycling committee head for LEAP (Lafayette Environmental Awareness and Protection), a member of the Lafayette Varsity Fencing team, and a volunteer for the Westward Neighborhood Partnership program with LANDIS. In the summer 2014, she will be working at Cambridge Biomarketing conducting research on rare diseases and leading a marketing team. She is grateful for the opportunity to be a part of the Tech Clinic as a way of furthering her passion for the environment and “getting her hands dirty.”
- ❖ **Caroline Craver ('15)** is a senior from Great Falls, VA. She is double majoring in Economics and Policy Studies. At Lafayette, she is a member of the Women’s Varsity Soccer Team and the Fed Challenge Team. In the summer of 2013, she interned for Accenture, a consulting firm, where she was able to contribute to non-profit projects. She is very excited and grateful to be involved in the Technology Clinic, and is looking forward to apply her knowledge of economics and consulting to the project.
- ❖ **Claire Hooper ('17)** is a sophomore double majoring in Engineering Studies and Visualization. She is from Minnetonka, MN and has traveled to Costa Rica, Nepal, Israel, and Italy. She is in a variety of clubs on campus including Alpha Gamma Delta, Society of Women Engineers, Student Movement Against Cancer, and volunteering at an art therapy session for women from the local prison.

Meet the Team

- ❖ **Kevin Jackson (16')** is a junior pursuing a science degree in geology as well as an arts degree in engineering studies; however, his interests aren't limited to those pursued in Acopian Engineering Center. Alongside his work with Tech Clinic, Kevin participates in LIME a program which sends students to teach high school students in Antananarivo, Madagascar. He is the Entertainment Co-Chair for Orientation Leaders; and he works as a tour guide (Tour Captain) for Lafayette and is a grader for Engineering Science 231, Nature of Materials.
- ❖ **Molly Leech (17)** is a sophomore majoring in Anthropology & Sociology. She is actively involved in a variety of clubs on campus, including Students for Sensible Drug Policy (President) and Lafayette Food and Farm CoOp (PR Chair). Additionally, she works as a Writing Associate (tutor) and as an intern for Special Collections at Lafayette College's Skillman Library. Hailing from coastal NJ, Molly has deep interests in hiking, gardening, photography, traveling, and writing. She presently lives in the academic living learning community "Botany House."
- ❖ **Victoria Parsons (15)** is a senior majoring in Biology. Her passions are soccer, as she was president of Lafayette College Women's Club soccer team for 2 years, and working on campus as a general biology teaching assistant. Victoria grew up in central New York, but currently lives and works in Boston. In the past, she gained technical skills in biology at Bind Therapeutics, and in the Coen Lab at Harvard Medical School, and is currently working on an Honors Thesis in biology. She is grateful and excited to be involved in the Tech Clinic, and is eager to apply her knowledge of biology and experience teaching to the project.

Faculty Facilitators

Prof. Lawrence Malinconico is an Associate Professor of Geology and Geophysics at Lafayette College and Director of the Technology Clinic program. He specializes in natural disasters, structural geology, and applied geophysics. He has worked and studied in 20 different countries including Pakistan, Italy, and Ecuador. He is a 25-year resident of Easton and currently resides on College Hill.

Prof. Dan Bauer is a Professor Emeritus of Anthropology at Lafayette College and Director Emeritus/Founder of the Technology Clinic program. His interests have ranged from engineering and technology to journalism and photography. Throughout his career as an anthropologist, he has done research around the globe, such as in Peru, Mexico, and Ethiopia.

Our Clients

- ❖ **Bangor Area School District** houses the greenhouse. Some members of the faculty have generously donated their time to help us understand the mechanics of the automated systems in the greenhouse.
- ❖ **Slate Belt Council of Governments** is the clearinghouse through which the funds for this project are managed.
- ❖ **Victor Rodite** has been working on returning the greenhouse to working order over the last 3 years.



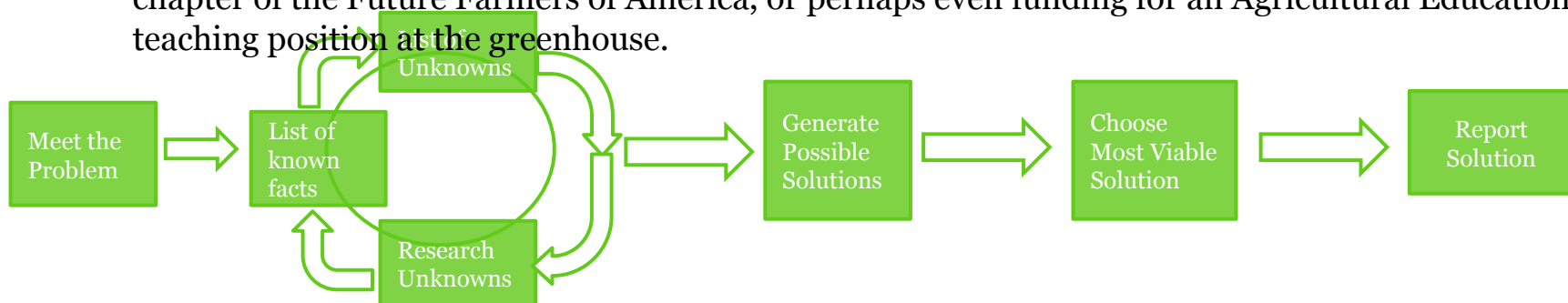
Mission Statement

It has been the goal of the 2014 Lafayette College Technology Clinic, with the guidance and support of the Bangor Area High School, to both encourage and facilitate the maintenance of healthy lifestyles in teens and the surrounding community, and, using the greenhouses at the high school, to present an innovative educational experience centered around sustainable agricultural practices.



Why

- ❖ The Greenhouse can be used as a valuable “Problem Based” learning opportunity.
- ❖ It provides:
 - A conveniently located out of the classroom experience on campus.
 - A place where students can observe the magic of nature through plants and responding to their love and care or lack thereof.
 - An ideal environment for team projects which also incorporates ample opportunity for individual aspects.
 - A laboratory for new ideas and technology to be tried and measured.
 - A student business incubator for creating new businesses - particularly those related to agriculture, horticulture, and hydroponics.
 - A potential source of revenue to be put towards a scholarship, scholastic organizations such as a local chapter of the Future Farmers of America, or perhaps even funding for an Agricultural Education teaching position at the greenhouse.



Why

- ❖ Furthermore, the fully functional greenhouse could:
 - Provide produce (healthy, local, and organic) to Slater Family Network as well as the Family and Consumer Science Department.
 - Educate the community using greenhouse projects on how to maintain a healthy diet using produce they can grow themselves.
 - Promote the habits instilled by Sean Covey's *Seven Habits of Highly Effective Teens* that have already made incredible differences in the lives of the DeFranco Elementary School students. A fully functional greenhouse could provide additional outlets for growth with these seven habits.
- ❖ Why it is good that Lafayette College students are doing this project?
 - Lafayette College students working with the students at Bangor Area High School encourages community, collaboration, teamwork, and creativity that motivates us all, as students, to work toward sustainable and healthy living habits for our communities and our future.



Purpose

The greenhouses at the Bangor Area High School are an invaluable resource. Bringing students outside of the classroom to give them hands-on experience has the power not only to teach, inspire, and engage the student, but also to impact the greater Bangor community. With continued efforts, together with the high school and community, we are working towards restoring the greenhouse back into the resource it once was.



via [Sue Beyer | The Express-Times](#)



Spring 2014

Spring Overview

- ❖ Starting our semester in the spring, we first evaluated what fundamental systems needed to be identified and repaired. Next, we focused the main portion of our time in experimenting with growing techniques and “greening the greenhouse”. We also developed relationships within the district and community as well looked ahead and planned for the Fall semester and working to get students involved.

- ❖ Experimented with 6 different projects including:
 - Vertical (Pallet) Gardens
 - Raised Beds
 - Bucket Gardens
 - Hanging baskets
 - Hydroponics and Aquaponics
 - Composting

Recap: Greenhouse Projects



Pallet Gardens
growing kale, spinach,
nasturtiums



Raised bed containing kale and cucumbers



Bucket gardens
containing a variety of
vegetables

Recap: Greenhouse Projects



Hanging Baskets containing herbs: basil, parsley, thyme, cilantro



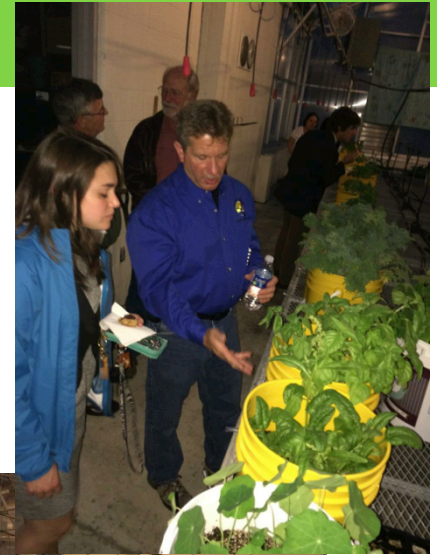
Established circulating water utilizing chillers and external pumps (prospective developments in aquaponics)



Compost bin containing nutrient rich soil

Relationship Building

- ❖ While “Greening the Greenhouse” we were able to:
 - Form a communicative network including community members, staff and students.
 - Benefit from the invaluable support from individuals from the greater community such as David Due, Gary Oiler, and Jim Sandt.
 - Take advantage of the invaluable resource that is Nancy Serulneck and her incredibly enthusiastic students.
 - Their involvement has continued to set a great tone for the greenhouse projects, and we look forward to seeing what they do next in the greenhouse.





Summer 2014

Summer Overview

Over the summer, Lafayette's Excel Scholars Program funded one of our team members, Kevin Jackson, to continue and maintain the greenhouse projects started in the spring. Over the course of the summer he:

- Experimented with and worked to start developing closed aquaponics and hydroponic systems.
- Maintained and expanded on previous “greening” projects.
 - Transplanted plants to La Farm Community Garden.
 - Donated bucket gardens and seedlings to Slater Family Network.
- Continued and developed community outreach.
- Organized greenhouse focused events.
- Started planning for the new greenhouse elective class at BAHS.
- Developed a blog to document progress.
- Gained notable media attention.

Summer Community Outreach

Over the summer, we established and reaffirmed communication with outside organizations individuals who can provide:

- ❖ Guidance for further curriculum and project development
- ❖ Insight and consultation for current projects
- ❖ Possible partnerships related for plant and flower sales

These Organizations and Individuals include, but are not limited to:

- ❖ Ginder Family Farm
- ❖ Sarah Edmonds, head of Lafayette's Organic Farm (LaFarm)
- ❖ Sophia Feller, community organizer & gardner at Easton Urban Farm
- ❖ Gary Oiler, former agriculture/horticulture teacher for district & volunteer and Quiet Valley Farm
- ❖ McCollian Farm

Hydroponics

- ❖ **Two hydroponics systems have been implemented at the greenhouse:**
 - **Floating Raft:** places plants in a soilless medium that rests on floating Styrofoam sheets. Constructing floating raft systems for groups of students provides the opportunity to run experiments related to the effects of plant & nutrient variations on plant growth in a floating raft system.
 - **Flood and Drain:** involves flooding a plant bed with water until a siphon quickly drains water back into the reservoir beneath the plant bed.



Media

“The greenhouses at Bangor Area High School are coming back to life.”-Express Times

Events such as the Fall Kick-Off Event have attracted the Express Times which has been indicative of the projects overall success and potential.

The article can be found at the following link:

http://www.lehighvalleylive.com/slate-belt/index.ssf/2014/08/bangor_area_high_school_green.html




Social Media: Blogging

We started a blog over the summer to keep track of the greenhouse endeavors - both the successes and the challenges! Blogging in the classroom, especially throughout project work is a great way for students to document their work and experiments. This would be a great way for students to take initiative, get involved, and share their stories with others. The blog serves as a platform upon which to post written editorials, videos, photos, how-to instructions, recipes, and more. This type of documentation is recommended in the greenhouse classroom.



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Bangor Greenhouse



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UNCATEGORIZED

Elective Period

by [jacksok](#) • October 27, 2014 • [0 Comments](#)

The past few weeks have been nothing but hectic! We have been sending tech clinic members all days of the work week to help facilitate and oversee the 5th block elective period at Bangor Area High School. The students have...

[Read more →](#)

ARCHIVES

- [October 2014](#)
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The current blog can be found at :
<http://bahsgreenhouse.blogspot.com/>



Fall 2014



http://www.esri.com/news/arcuser/0402/graphics/preserve1_1g.jpg

Fall Overview

This fall we have worked to get students involved by getting the greenhouse elective up and running.

- ❖ We researched plants, and planned for a plant sale to generate revenue.
- ❖ Collaborated with teachers, and taught in the classroom.
- ❖ Developed curriculum, lesson plans, manuals and calendars for present and future semesters.
- ❖ Introduced two hydroponics setups (floating raft, flood & drain) which show the diversity to the discipline in addition to providing a wealth of opportunities for learning.

To bring the spring projects and planting full circle, we

- ❖ Gave produce back to Chris Peter's culinary class to cook with
- ❖ The students experimented with plant propagation and horticulture for future plant sales.

This semester's trial run of the elective classes allowed us to learn and then refine the organization of the class.

Student Involvement

- ❖ With the help of Josh Egners and Adam Raines, we reached out to students every day of the week through the 5th block elective period.
- ❖ Nancy Serulneck and her students have played an important role in the greenhouse by tending to plants and starting projects of their own.
- ❖ Chris Peters's class has used our produce in countless recipes.
- ❖ We have partnered with Gail Price and her recycling club to repurpose plastic bottles.



Photo Credit: Lehigh Valley Live

Incorporated other elective classes

- ❖ Chris Peters used greenhouse produce in her cooking classes with students.
- ❖ Her class's involvement with the project shows the tremendous potential the greenhouse has to involve students in different disciplines throughout the school.
- ❖ In these efforts, there is hope to encourage other classes to follow Peters's example and partner with the greenhouse.



Media Attention

lehighvalleylive

1 Bangor high school student get hands dirty, try for cleaner earth in greenhouse



Michael Holva, Raquel Zieba, Logan Serfass and John Casimiro work together as they plant their tray with seeds. Bangor Area High School students plant seeds Oct. 2, 2014, in the school's newly refurbished greenhouses, under the guidance of members of the Lafayette College Technology Clinic.

View Gallery | The Express-Times

1 / 15

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Caption

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Odd Trick "Fights" Diabetes



Wrinkle Trick Horrifies Surgeons



Forget Googling Their Name. Try New Site



Controversy over New Steroid Alternative

High School Sports



The Slate Belt's source for scholastic sports

Find stats, rosters and schedules ... All high school sports

Bangor Area High School greenhouses, long dormant, being nurtured to grow



Bangor Area High School is teaming up with Lafayette College to make use of the high school's greenhouses. Lafayette College Technology Clinic member, Kevin Jackson is working on setting up an aquaponics system that uses fish in the greenhouse. Express-Times Photo | SUE BEYER (Sue Beyer)

By Lynn Ondrusek

Email the author | Follow on Twitter

on August 09, 2014 at 6:15 AM, updated August 10, 2014 at 1:47 PM

Print

The greenhouses at Bangor Area High School are coming back to life.



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High School Sports



The Slate Belt's source for scholastic sports

These articles can be found at these links:

- http://www.lehighvalleylive.com/slate-belt/index.ssf/2014/08/bangor_area_high_school_green.html
- http://www.lehighvalleylive.com/slate-belt/index.ssf/2014/10/student_greenhouses_growing_fo.html#incart_related_stories

Manual

Over the course of the Fall semester, the Tech Clinic and various community members have worked to compile a manual for the greenhouse student programming. A few things this manual includes are:

- ❖ Detailed descriptions of the various greenhouse projects
- ❖ General organization and maintenance
- ❖ Supplies and systems
- ❖ “How-To” instructions for basic planting techniques
- ❖ Finances and Expenses

Curriculum/Calendar

Looking ahead to future semesters in the greenhouse, a suggested start up curriculum for the elective class has been compiled. The curriculum includes:

- ❖ A calendar of each month of the semester with weekly plans according to the timing of starting plants and the start of the planting seasons.
- ❖ Additional explanations of the activities on the calendar.
- ❖ Calendar and curriculum explanations for both a Spring and Fall semester
- ❖ A contact list for both suggested guest speakers and experts in a variety of fields pertaining to the greenhouse elective that are willing to help give advice and suggestions for the greenhouse curriculum.

To see this curriculum, please refer to the Curriculum and Calendars booklet.

Ways to give back to the community

One important part of the greenhouse project has been the idea of giving back to the school and the community. Ways to do this include:

- ❖ Making bucket gardens and distributing them to local assisted living centers, Slater Family Network, local food shelves, etc to give to families and community members that do not have space for a garden and home grown produce.
- ❖ Donate produce grown to either consumer science classes in the high school (for cooking) or to the local food shelves.
- ❖ Extra greenhouse space could be rented out to local community gardens to start seedlings.

Giving back to the community is important because of the various community resources that are being volunteered for this greenhouse program, specifically the time and knowledge put in by various community members. (Refer to “Contacts” page in the Appendix).

Future Thinking: Making this elective self-sustaining

Another important aspect of the greenhouse project is the possibility of an annual or semi-annual flower sale. A flower sale would be beneficial because it could:

- ❖ Give the students the responsibility of growing their own flowers and having a hands-on project in the greenhouse
- ❖ Get family members and community members involved in the greenhouse
- ❖ Use the money raised from the sale and buy materials for the greenhouse
- ❖ Get students that are not in the elective period involved and interested in flower planting
- ❖ Begin a project that can be sustained over the following semesters
 - Bucket Gardens
 - Flood and Drain Hydroponics
 - Plant Sales

Future Thinking: Financing the Greenhouse

A spreadsheet on page 34 includes expenses incurred over the past semester in order to “Green the Greenhouse. We used these supplies for the following projects:

- ❖ Bucket gardens
- ❖ Hanging baskets
- ❖ Flowers for future flower sale
- ❖ Raised Garden
- ❖ Pallet Garden

The spreadsheet can be used as a guide for allocating funds for future semesters.

Future Thinking: Financing the Greenhouse

Spring 2014 Cost Sheet

Type of Item	Cost	Number of Items	Total
Planting Soil	\$35	6	\$210
Potting Soil	\$13	2	\$26
Educational Supplies	\$34	2	\$68
Seeds	\$2	30	\$60
Shade Cloth	\$13	1	\$13
Root Grow	\$6	1	\$6
			Total \$383

Future thinking: Ideas to be explored

- ❖ Incorporate other classes and clubs:
 - Give produce grown to Chris Peters' consumer science class.
 - Make greenhouse available to other classes such as biology and other science courses as an educational supplement.
 - Work together with the composting club to help maintain an effective compost pile.
 - Continue to partner with Nancy Serulneck's students
- ❖ Develop the greenhouse elective into a certified Future Farmers of America (FFA) elective class. This will help provide a more distinct and set curriculum.
- ❖ Experiment with innovative ways to grow plants. Do projects the students are interested in.



Future thinking: Ideas to be explored

- ❖ Experiment and start a drip irrigation system with plastic bottles and recycled resources. (Work with the recycling club to get plastic bottles.)
- ❖ Further develop and experiment with making sustainable growing systems, hydroponics, and aquaponics systems.
- ❖ Partner with the cafeteria staff - to save organic waste for compost, and grounds staff - to save grass clippings - for compost.



Future thinking: Possibilities for the Classroom

- ❖ Based on student interest levels and classroom efficiency, it appears that a class size of about 15-20 students best lends itself to greenhouse activities.
- ❖ Either 1 or 2 classes should meet three or two times a week respectively.
- ❖ Under this schema, students would be able to work either independently or in small groups with active engagement depending on the projects operating in the greenhouse.
- ❖ Under the proposed curriculum, the class could run either per semester or per annum.

A photograph of a nasturtium plant with large, round, green leaves and a single bright orange flower. The plant is growing in a dark-colored pot. A horizontal green bar is overlaid across the middle of the image, containing the word "APPENDIX" in black, serif, all-caps font.

APPENDIX

What to Grow

These plants fared best in the greenhouse over the past two semesters:

- ❖ Broccoli: Only plant one per bucket!
- ❖ Cucumbers: Need to be pollinated in order to grow, which can be a problem in the greenhouse.
- ❖ Kale: particularly hearty green that can be grown in great abundance. Many varieties (red russian, curly, lacinato).
- ❖ Peppers: Grow well in bucket gardens.
- ❖ Zinnias: Grow well in the greenhouse, but other varieties (profusions) would make better potted plants for sale.

For hydroponics: lettuce, coleus, and other leafy greens generally grow best in this system.

Contacts and Resources

If you are looking for advice, expertise or people willing to help, we recommend contacting:

1. Victor Rodite
 - a. General greenhouse programming and student involvement
 - b. Contact at: rodite@slatebeltcog.org
2. Jim Sandt
 - a. Information and expertise on agriculture and growing vegetables
 - b. Contact at: (610)-759-6275
3. Gary Oiler
 - a. Information and extensive experience with flowers and plant sales at Bangor
 - b. Contact at: (717)-860-6097 or soiler@ptd.net
4. Nancy Serulneck
 - a. Contact at: serulnen@bangorsd.org
5. Chris Peters
 - a. Contact at: chrispeters517@gmail.com
6. Corinne Hayes
 - a. Food Science Teacher
 - b. Hayesc@gmail.com
7. The McCollians
 - a. Knowledge and experience with hydroponics
 - b. Contact at: Patrick.McCollian@ge.com
8. David Due
 - a. Knowledge and experience with aquaponics
 - b. Contact at: (610)-657-4298 or cyberdue@epix.net
9. Ginder Family Farm
 - a. Local Greenhouse Business
 - b. Joann Ginder
gindergreenhouse@gmail.com