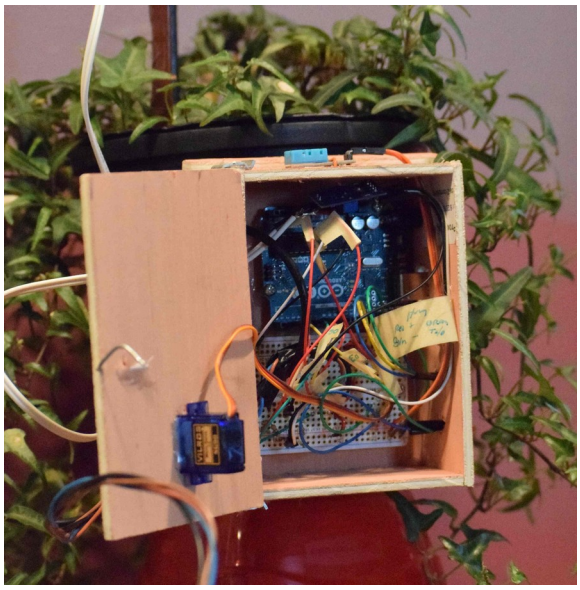
The forestry ecosystem technology project

Proposal for the John Dziak Faculty Development and Engagement Fund | Submitted: 2 April 2018

Prepared by: Eric Darsow | CIT Faculty | CCAC North Campus/West Hills Center | edarsow@ccac.edu

Goals

1. Cultivate skill in collaborative experimentation and technical project development.
2. Deploy technology tools to support data-based inquiry into the interaction between natural and human ecosystems.
3. Build a collection of cleaned, documented data sets related to natural-human ecosystem interaction to act as seeds for future student projects in a variety of CCAC courses
4. Connect high school students from under-privileged backgrounds with CCAC students to lubricate the transition from high school to college learning environments.



The Plant Hugger is a prototype device built by the applicant and ready for tinkering and adapting by participating students.

Project synopsis

This applied research project involves crafting inquiry questions about human-environment interactions and then designing technology tools to help answer those questions in systematic, data-driven ways.

The base tool for this inquiry is the Plant Hugger—a sensing device I designed to measure various attributes of plant life (soil moisture, temperature, humidity, etc.) and inject that data into a central repository. It runs on a wifi-enabled mini-computer called an Arduino which costs only $20 and can connect to other wildly affordable computer devices such as the Raspberry Pi. With a working prototype already tested, the technology is ready for students to learn about and expand upon during this project.

Measurable project outcomes by implementation phase

Phase	Activity	Measured Outcomes	Time frame
1	Applicant will document and modularize the existing Plant Hugger device for collaborative expansion by project participants.	Easy-to-digest documentation of Plant Hugger internals is produced.	April – June 2018
2	Recruit a handful of CCAC students during Spring 2018 to co-lead Phase 3 with the high school students over the summer.	Recruited students will submit a ½ page letter of intent for participating in the project.	Spring Term 2018
3	Collaboratively Engage high school students participating in Pittsburgh's Summer Youth Employment Program through Youth Empowerment Services (based in East Liberty) in designing and testing variations of the existing Plant Hugger device, learning about basic electronics, wood working, and data-based inquiry as we go.	High school summer program participants will take a pre- and post-survey relating to their college aspirations to measure the impact of the CCAC-High school interactions.	June – August 2018

4	Re-engage CCAC students and high school participants in Fall 2018 to join phase 3 of the project which continues building modules for the Plant Hugger device and generating data for the project repository.	Each participating CCAC student or pair of students will produce a documented and cleaned data set created by their customized Plant Hugger device.	Fall term 2018
5	Produce a plant hugger showcase video to introduce future high school and CCAC students to the collaborative technology project	Student shot and edited promotional video is uploaded to a public video repository	End of Fall 2018 and January 2019.

Justification for forests as laboratories

Student exploration is enriched by escaping traditional bounds of educational spaces and venturing into natural environments where species and processes are interconnected and symbiotic. As complicated natural ecosystems, forests are ripe laboratories for this kind of inquiry. Not only is dedicating time to exploring a natural system rich with educational possibilities, but devoting time in forests is an enriching human experience with spillover effects into other dimensions of student life.

Project budget

The grant funds will be used to purchase electronic raw material for students to build their own versions of the Plant Hugger system. The budget covers creation of 8 new Plant Hugger devices. All software used to develop the driver programs are free and open source. The mini-computer components are dramatically affordable and are therefore great candidates for student experimentation at low cost.

Cost estimates are based on prices listed by Adafruit.com, a popular hobby electronics online retailer with which the applicant is familiar.

Item	Unit Price	Quantity	Extended price
Arduino Metro development board (micro-controller)	$19.50	8	$156.00
Raspberry pi 3 (mini-computer)	$35.00	5	$175.00
Environmental sensors misc: IR beam-break sensors, humidity sensors, temperature sensors	$3.00	20	$60.00
Ambient noise monitors	$7.00	5	$35.00
Constructions supplies for 8 devices: Wood, screws, glue, bungee cords, etc.	$9.00	8	$72.00
		Total	**$498.00**

Assessment of project success

Each of the project outcomes listed in the phase chart will be assembled into a final documentation. A successful will be the creation of each of the outcomes by phase. Additionally, qualitative data will be gathered from participating students by asking them to write responses to a few open-ended questions:

1. How do you envision the skills you acquired in this project propelling you future endeavors?
2. How could you improve your project experience for future students?