

Project: Botany Program**Author: Andrew Centanni****Grade: High School****Subject: Biology****Duration: 2+ years**

Description

I started the Zoology/Botany program to give students a better foundation in evolutionary theory and ecosystem ecology. I also wanted to give my students relevant, valuable experiences that allow them to feel knowledgeable and empowered as they become independent citizens.

The success of the project will be demonstrated through student engagement and feedback, stakeholder (admin, community, etc.) feedback regarding our garden space, and the validity of the data we collect in our citizen science project.

I am trying to teach the students three basic things:

1. the fundamentals of evolution
2. science and engineering skills
3. life and job skills

Purpose

1. The overarching goal of this project is to enable students to contribute to the creation of a more sustainable world by giving them a set of opportunities through which they can better understand their relationship with that world. These opportunities come in the form of curriculum, community partnerships, and a "living lab" in the form of an indigenous garden space.
2. Due to the differentiated nature of the Zoology/Botany course and the interdisciplinary intentions of the space, specific learning objectives are diverse. However, as stated earlier, the most involved students have objectives related to the fundamentals of evolution and science & engineering.
3. Student Horticulturists will also be given "managerial" roles once they've reached a certain level of mastery. The ultimate goal is to make this a whole-community project rather than my own "pet project," such that it will be maintained long after my retirement/departure.

Materials/Resources

Majority of resources provided by stakeholders

- Greenhouse
- Gardening materials (potted plants, seeds, soil, containers, gardening tools)
- Wood, cinder blocks, concrete
- Photovoltaic installations
- Communication tools (computers, email, phones, etc.)
- Power tools, heavy machinery (for movement of earth, concrete, etc.)

Process of Development

- I had meetings with & gave presentations to admin & staff at my campus, I formed partnerships with ASU's Sustainability Teacher's Academy, Greenhouse faculty at Mesa Community College, the Desert Botanical Garden, and the Sonoran Photovoltaic Lab
- Recruited students and community members from my campus to volunteer. The latter volunteers were particularly involved during the "deconstruction" phase of our garden renovation, which involved removing old, outdated (and at times, potentially dangerous) installations in preparation for newer, safer, more sustainable ones
- Created an "Operator's Manual" for the garden space to allow others to better understand the goals and operations of the space as it develops

Student Involvement

Students in my Zoology/Botany classes complete year-long projects of their choice/design, and many of these students become "horticulturists" for their projects. These "horticulturists" learn the fundamentals of horticulture and sustainable desert landscaping, and as they do so, they take on leadership roles in the maintenance and development of the garden space. Their efforts are aided by students in the Nature Clubs, who focus on promoting sustainability in an extracurricular capacity and make up the bulk of the student volunteers that help bring the project to fruition. As the project progresses, the intention is to integrate the garden space into other courses' curricula as well.

With regards to state/federal standards, the various tasks that students take as they interact with the garden space relate to the NGSS life science categories of Structure & Function, Matter & Energy in Ecosystems, Interdependent Relationships in Ecosystems, and Inheritance & Variation of Traits (plant propagation).

Learning Objectives

1. Students will increase their mathematical competency in solving real-world problems involving mathematical applications in the context of a school's outdoor and indoor garden
2. Students will improve their data recording and tracking skills by being immersed in a real-world context of a garden providing multiple opportunities for data analysis application (e.g., tracking germination rate, measuring plant growth over time, determining water consumption, and more)
3. Students will develop/strengthen their leadership skills, improve cooperation, and demonstrate responsibility as a result of managing and maintaining the garden with their classmates and students from other grade levels
4. Students will learn about sustainable practices including building and maintaining a school garden

Reflections from Author

To do this project, you must have a strong, distinct vision that others can latch onto. It may take time (and maybe even conversations with stakeholders) to develop this, but in my experience, such a vision has been crucial to garnering support. There's no reason to do everything yourself, and people love to help others with things they're good at, so reach out! The more you can give ownership to your stakeholders and your community, the better.

Feedback from students in the Nature Clubs, as well as those who completed a "beta version" of some of the garden-related curricula, have indicated that students are eager to do relevant, hands-on work, and students feel as though they learn more and contribute more when doing such work. I've even received multiple thank-you notes from students who enjoyed horticultural work and who felt what they were learning/doing "meant something."

The big barriers are money and manpower. In other words: financing the changes we'd like to make to the garden space and then getting enough people to help enact those changes. I overcame these barriers through communication; reaching out to those who knew better than me, or who were simply willing to help. This meant sending emails, making google groups, having in-person meetings, applying for grants, and more.