GreenGrant

Office of Sustainability

2024 - 2025 Awardee

Engineers for Climate Action

Engineers for Climate Action (ECA) was founded to use engineering design and science to combat climate change. ECA hopes to unite Temple University Engineers who are concerned about climate change. The organization discusses and researches how engineers can more effectively engage in advocacy roles and climate solution generation. Through collaboration with other student organizations and direct application of original engineering approaches, they create tangible impacts in our local community.

Award Amount: $1,086.00

Temple University
Office of Sustainability

The Hydroponics System

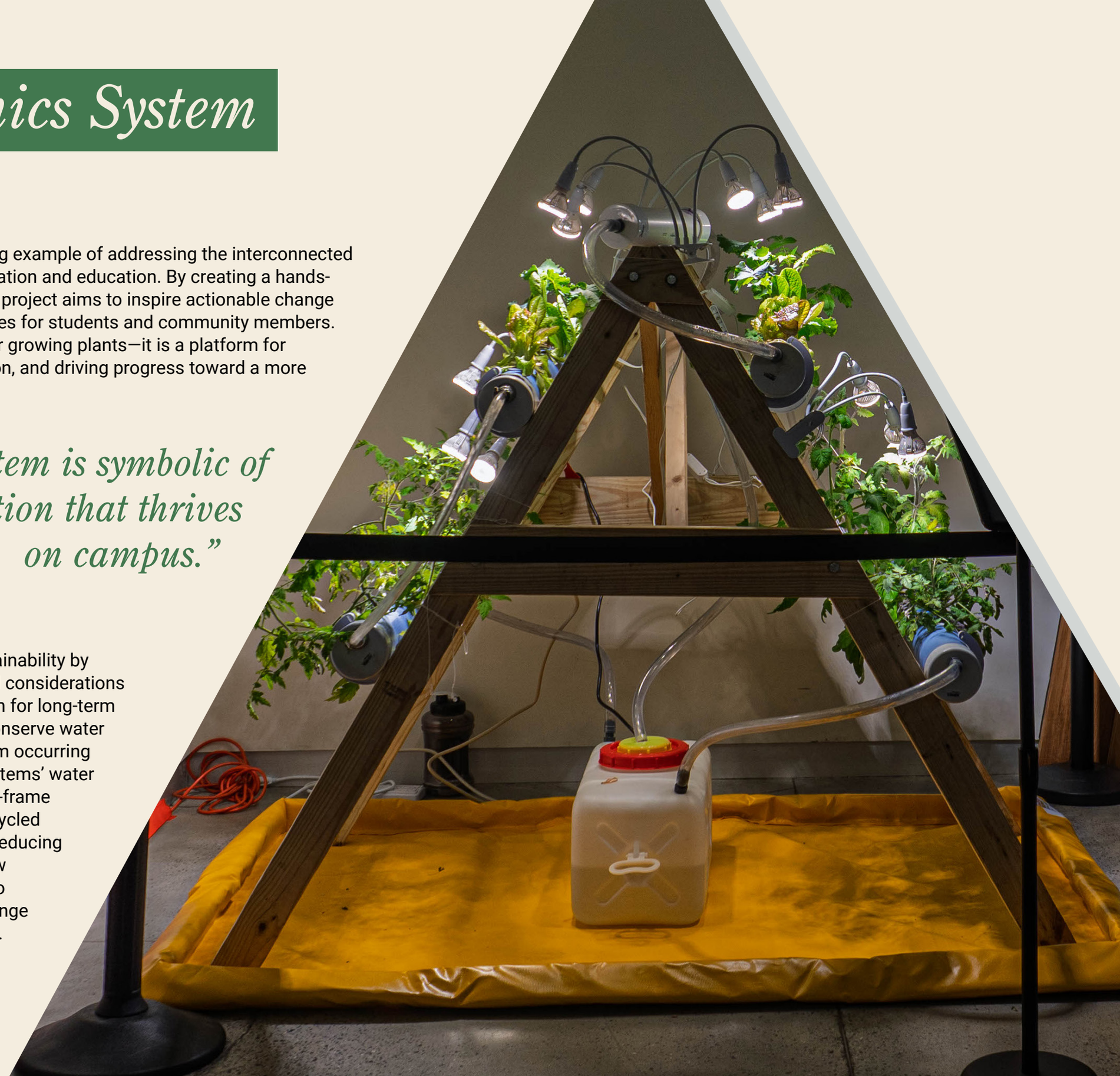
Project Description

This hydroponics system represents a strong example of addressing the interconnected challenges of climate change through innovation and education. By creating a hands-on, scalable model of urban agriculture, this project aims to inspire actionable change and provide meaningful learning opportunities for students and community members. The hydroponics system is not just a tool for growing plants—it is a platform for cultivating awareness, fostering collaboration, and driving progress toward a more sustainable future.

"Our hydroponic system is symbolic of sustainable innovation that thrives on campus."

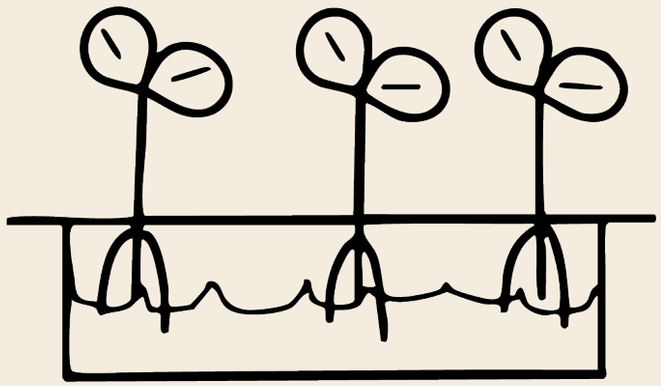
About Hydroponics

The design integrates the principles of sustainability by addressing ecological, economic, and social considerations through thoughtful system design and a plan for long-term monitoring. Hydroponic systems not only conserve water usage, but they prevent soil degradation from occurring during traditional farming practices. The systems' water efficiency is an economic perk as well. An A-frame modular design allowed the team to use recycled piping as the material in the trough design, reducing the pump size required to support water flow at that height. The design also contributes to mitigating the social impacts of climate change increasingly associated with food insecurity. The hydroponic system is symbolic of sustainable innovation that thrives on campus.



About This System

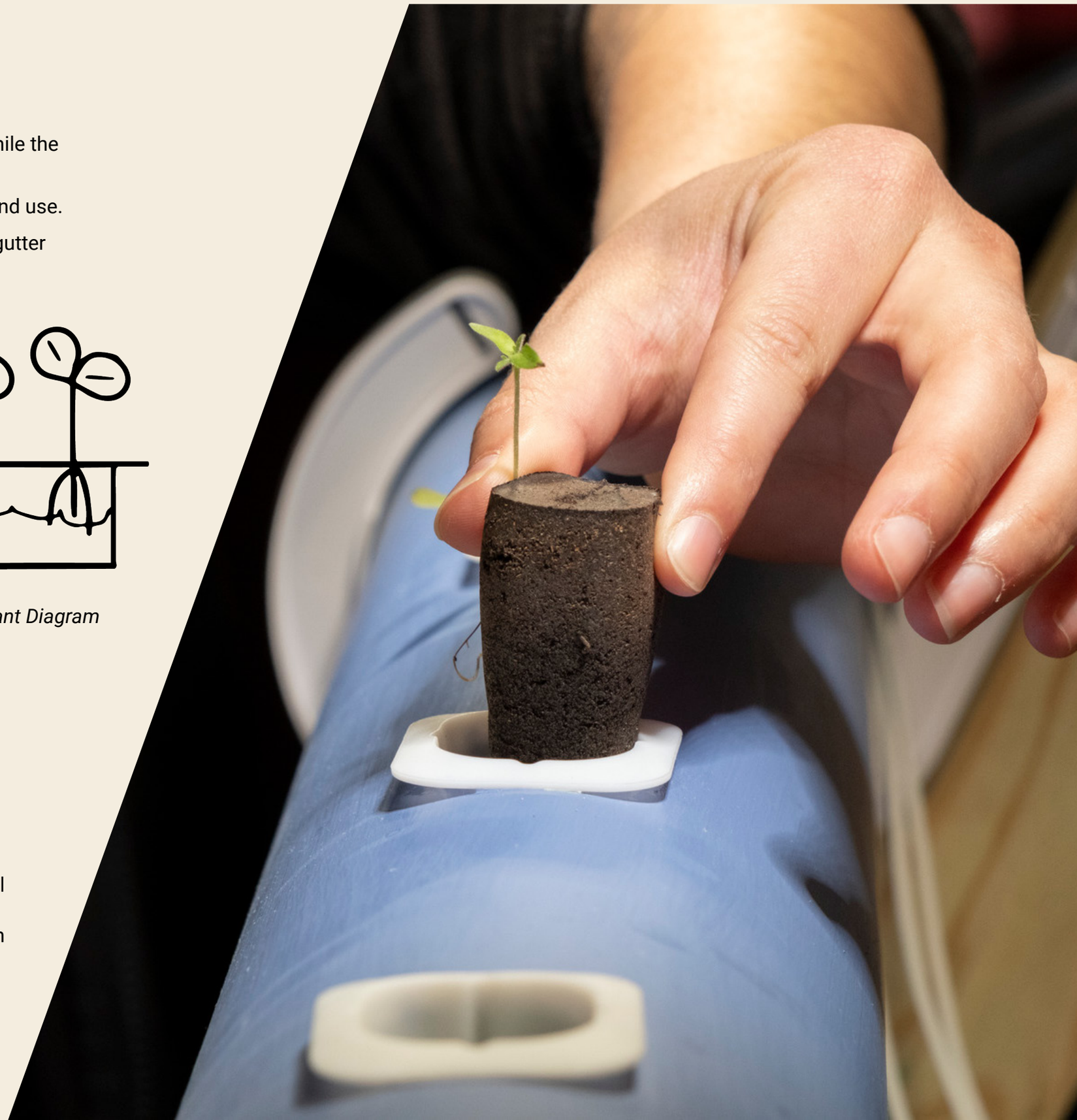
- ***Air-gap:*** Plant roots hang partially in nutrient-filled water while the upper part of the root system is exposed to air (oxygen).
- ***Prevents soil degradation:*** Reduces the need for soil and land use.
- ***Features a modular A-frame structure*** made with recycled gutter piping and minimal energy requirements
- ***Utilizes reclaimed PVC drainage pipes*** as the plant rack
- ***Inspired by the need for compact, water-efficient systems*** in urban environments



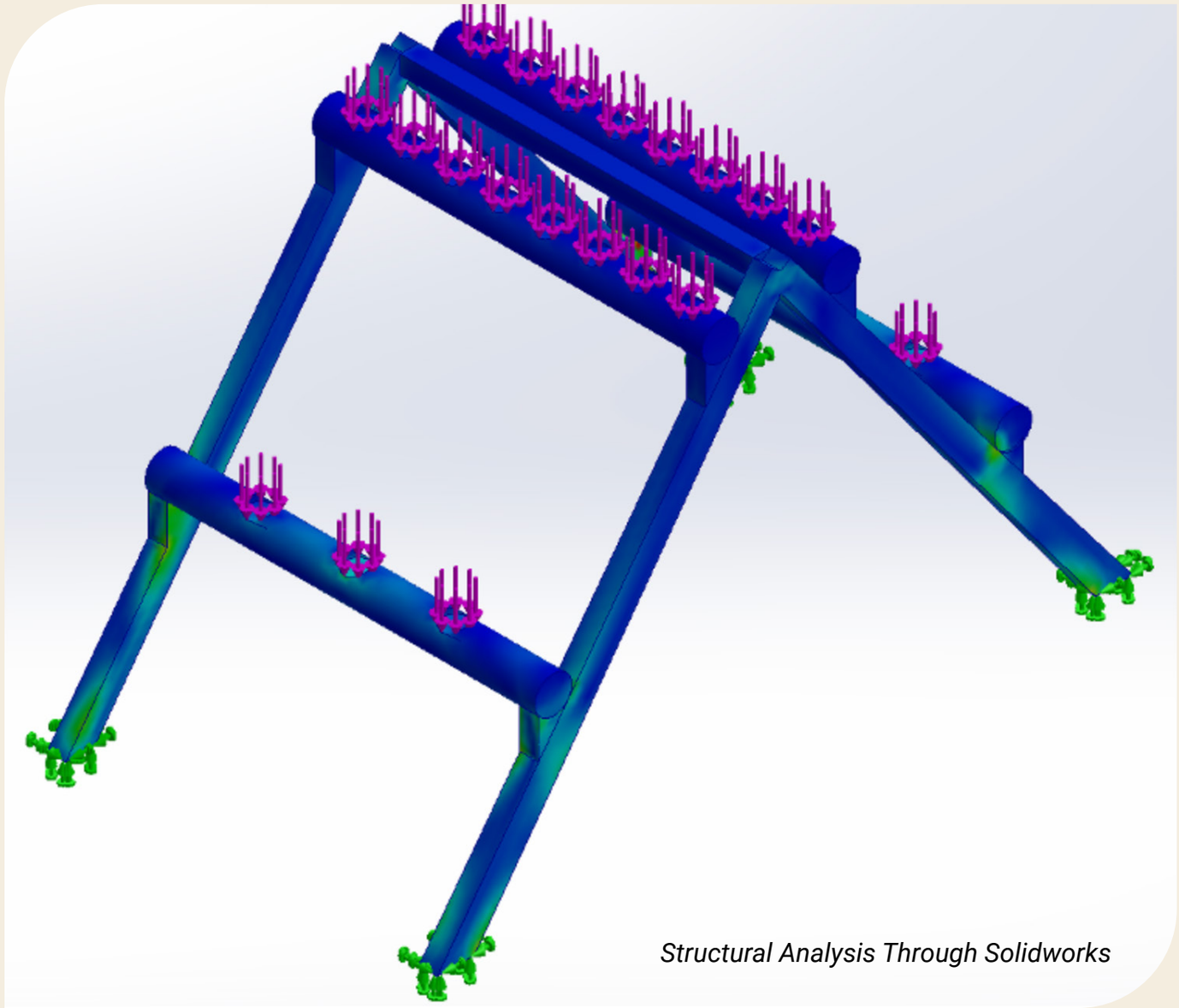
Hydroponics Plant Diagram

Why Use Hydroponics?

- ***Enhances plant yields:*** plants can be more densely packed than when planted in soil on land, leading to higher yields. In addition, pH, nutrients, and light availability can be constantly monitored and controlled.
- ***Less water:*** as much as 10 times less water than traditional field crop watering methods. The water reservoir recycles nutrient rich water instead of allowing it to run off and drain to the environment.
- ***Locally grown:*** Indoor hydroponic systems allow plants to grow almost anywhere all year round.



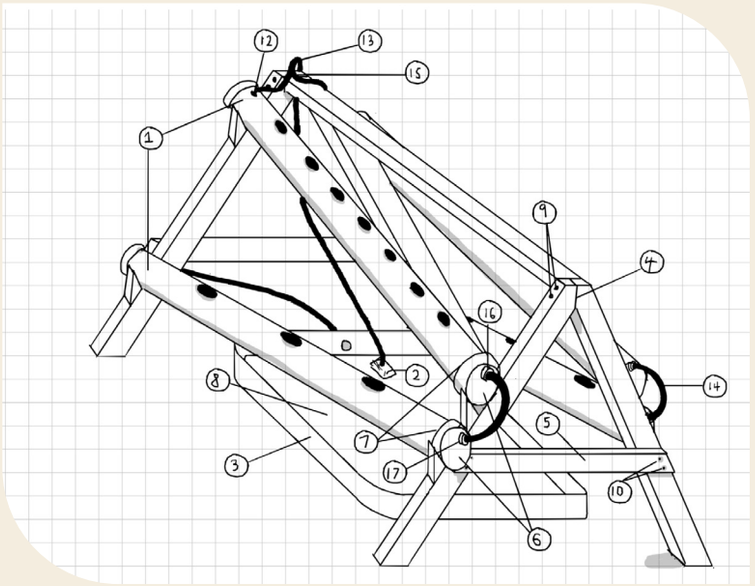
Design Process and Installation



Structural Analysis Through Solidworks

The design on the left shows the results of the SolidWorks simulation run on the model of the hydroponics design.

Using the known properties of wood, a stress analysis was run to determine if the estimated loading on the structure could result in failure. Blue areas on the simulation model represent regions of material that will not be under a significant amount of stress. With accounting for the mass of the water, the plants, and the apparatus itself, it was found that the structure is adequately designed against failure.



Annotated Design Drawing

Hear From the Student Leaders

Alexander Guilbot

on what sustainability means to him

“adaptability ... being able to adapt to the changing needs of an environment means we must utilize renewable resources.”

Maddy Mailloux

on how ECA’s project is making campus more sustainable

“not only do our crops use ~90% less water than traditional methods, but the living installation serves as a reminder to all students on campus that there is a culture of sustainability here at Temple.”

Erich Sands

on working with the Temple Community Garden

“A little extra effort goes a long way when it comes to sustainability ... working in collaboration towards a common goal can do a lot of good in our campus.”