

Design Proposal Template:

School: Sonoran Science Academy-Tucson State: Arizona

Division:

High School

Team Members' Names: Anika Kasaragod Pallath, Angelique Correa, Johnathan Barbeau, Jake Fraser

Project Title: Should be creative and give readers a general sense of what the project is about and want to read more. (20 word maximum)

AquaWhisper: listens to plants and delivers perfect drops.

Community Challenge Being Addressed: Describe the community challenge that you will attempt to address with your proposed solution. (75 word maximum)

Water scarcity is a major challenge in Tucson, where long-term drought and high temperatures strain limited water supplies. Many homeowners with desert landscaping unintentionally waste water by overwatering plants that require minimal irrigation. This not only increases household water use but also places stress on local water systems and community gardens. Our project aims to reduce unnecessary water consumption by delivering the exact amount of water each plant species needs.

Community Research and User Identification: Explain the process used to identify the community challenge and select your user. Include any research done to identify issues in your community and understand which groups face challenges because of these issues. (150 word maximum)

To identify the most pressing water-related needs in our community, we reviewed local drought reports and guidelines from water agencies. We observed that many households with diverse landscaping overwater plants because they do not know the amount of water required for each species. In the Tucson metro area, roughly 40% of residential water use goes to outdoor/landscape irrigation, according to the City of Tucson (.gov). Several community gardens expressed similar challenges, with volunteers frequently watering plants unevenly. We spoke with homeowners and garden coordinators who described difficulty keeping plants healthy during extreme heat while trying to conserve water. These conversations helped us understand that users want a simple, plant-specific watering system that reduces waste without requiring constant monitoring. We selected homeowners with diverse landscaping as our primary user group because they represent a large portion of local water consumption. Community gardens/Landscapers serve as the secondary group facing similar challenges.

User Profile: Provide a detailed description of your selected user. Include information about challenges they face, how those challenges impact their lives, and specific project needs based on user feedback. (150 word maximum)

Our primary users are a teacher who enjoys gardening and a small business landscaper in Tucson, both of whom work with diverse species of plants and aim to conserve water while maintaining the health of their plants. These users often struggle with knowing exactly how much water different desert plants need, especially during drought restrictions. Many rely on guesswork or inconsistent watering schedules, leading to wasted water, higher bills, and unhealthy plants. Users told us they want a way to automate watering, specialized to each plant species. This allows for plants to get the optimal amount of water, allowing them to be healthy, without installing expensive irrigation systems or constantly adjusting timers. Feedback from these users emphasized that the solution must be easy to set up, customizable for different plant types, and capable of expanding to larger garden areas in the future.

Project Goals: List your project goals and explain how these goals will address the community challenge. Project goals should define the desired outcomes, not specific features of the proposed solution. (150 word maximum)

Our project focuses on helping communities use water more efficiently and make smart, sustainable watering choices. Our goals are:

1. Provide the right amount of water for each plant based on its species.

Outcome: Plants get exactly what they need to thrive, reducing waste and improving health.

2. Reduce unnecessary water use for homeowners in drought-prone areas.

Outcome: Families conserve water, helping the community manage scarce resources.

3. Make the system and app easy to use for everyone.

Outcome: Even people without technical experience can adopt sustainable watering practices.

4. Offer clear data on water usage.

Outcome: Users can track and adjust habits to save water more effectively.

5. Develop a scalable system for any garden size.

Outcome: Both small and large gardens benefit, expanding the community-wide impact.

These goals address the challenge of water scarcity by promoting conservation, smarter decision-making, and sustainability in daily gardening practices.

Proposed Solution: Describe your proposed solution, including any innovative and unique features, and explain how this solution will address your users' needs and the challenges they face. (150 word maximum)

Our proposed solution is a smart micro-irrigation system that uses plant-specific data to deliver only the amount of water each plant needs. The system includes a small water reservoir, a pump, a flow sensor, and solenoid valves controlled by a microcontroller. Users select their plants in an app, which references a database of recommended watering amounts for a diverse species of plants. The system then measures and dispenses water precisely based on each plant's requirements. Real-time data from the flow sensor allows users to track consumption and identify savings through the same app. Although our prototype serves 1–3 plants, the design is modular and can be expanded to multiple valves for full gardens or community gardening spaces. This solution addresses users' needs by preventing overwatering, saving water, simplifying plant care, and adapting to the extreme climate of Arizona.



2025-2026 MESA USA
National Engineering Design Competition
Designing for Local Change

Initial Design: A single graphic of your first design idea with key features adequately labeled. It should be easy to understand, and the reader should have a general understanding of how the prototype functions by looking at the graphic. Max size 8.5" x 11". May contain up to 4 views of the design.

