Design Proposal Template:

School: Early College High School **State: Oregon** **Division: Middle School or High School**

Team Members' Names: Melissa Miranda, Abu Balogun, Panha Sen, Oscar Amaro

Project Title: Readers should have a general sense for what the project is about and want to read more. (20 word maximum)
MAPO™ tofucool: A Solar-Powered Water Temperature Regulation System Designed to Offset Thermal Pollution and Water Scarcity
Inequity Being Addressed: Describe the inequity that you will attempt to address with your proposed solution, and why you chose this inequity. Students are able to consider a global perspective related to their inequity. (75 word maximum)
Thermal pollution caused by AI and data center cooling systems. These systems rely heavily on water-cooling systems, raising water temperatures. AI has expanded rapidly—Google's data center in The Dalles uses 29% of the city's water (Science Direct). Under-resourced communities are increasingly impacted by water scarcity as tech-driven industries grow without adequate oversight. This expands climate and health disparities. We chose this inequity due to our client's close work with AI technologies and its effects globally.
Community Research and User Identification: Explain the process used to identify the inequity 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)
Our member, Panha, expressed concern when the fish in her backyard pond were acting strange. We measured the temperature and it was higher than normal; we decided to investigate. Eventually, we contacted Sonya Patino, who introduced us to AI data centers. Sonya communicated issues about their large energy usage and environmental effects, like thermal pollution. The University of Tulsa reports that data centers significantly drain water resources in already water-stressed regions, compounding ecological harm. In Oregon, similar risks are emerging for rural farming towns and lands, where water is scarcer and access is shaped by long-standing inequalities. These facilities require tremendous amounts of water for cooling, increasing energy and environmental costs. Continuing our research, we also learned this issue can cause thermal shock to aquatic life like salmon and steelhead that require water temperatures of 15ºC for "optimal survival and reproduction" (Perch Energy) (Carbon Europe) (Eco Health).

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)

Sonya Patino is a technical program manager at Microsoft. She works closely with quantum computers and AI data centers, managing related system testing, and technical and customer communications. Through interviews, Sonya has raised concerns relating to these high-energy and water-demanding technologies. She was also concerned about their impact on rural or under-resourced regions where facilities and supplies are less therefore thermal pollution is more rampant.

Following this, it became clear that data centers and their impacts would only keep growing, making this an issue needing a solution. After digesting all input, we determined the following needs based on her feedback:

- **Reduce the environmental impact imposed by AI data centers. More specifically, reduce pollution relating to water and energy demands used for cooling.**
- **Design a scalable and efficient model that can be replicated for less.**
- **Ensure sustainability for rural areas that can be heavily affected.**
- **Minimize resources used for our design.**

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

Our main goal for this project is to create a device that can lower water temperature and prevent environmental contamination. After digesting research and feedback, we established the following desired outcomes:

- **Cooler water temperatures and make it safer for wildlife**
- **Reduce water and energy strain due to industrial tech**
- **Design for scalability for rural and low-resource users**
- **Spread awareness about thermal pollution**

These goals will help us address communal inequality by reducing the impact of AI data centers and other large contributors to thermal pollution. It should minimize climate change as well as reduce the energy AI needs to cool the water in its data centers. Research shows that global water temperatures have risen by 2 degrees Fahrenheit since 1850 (Climate.gov). If we implement our device in local affected areas, we can serve our community while spreading word globally regarding the adverse effects of AI.

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

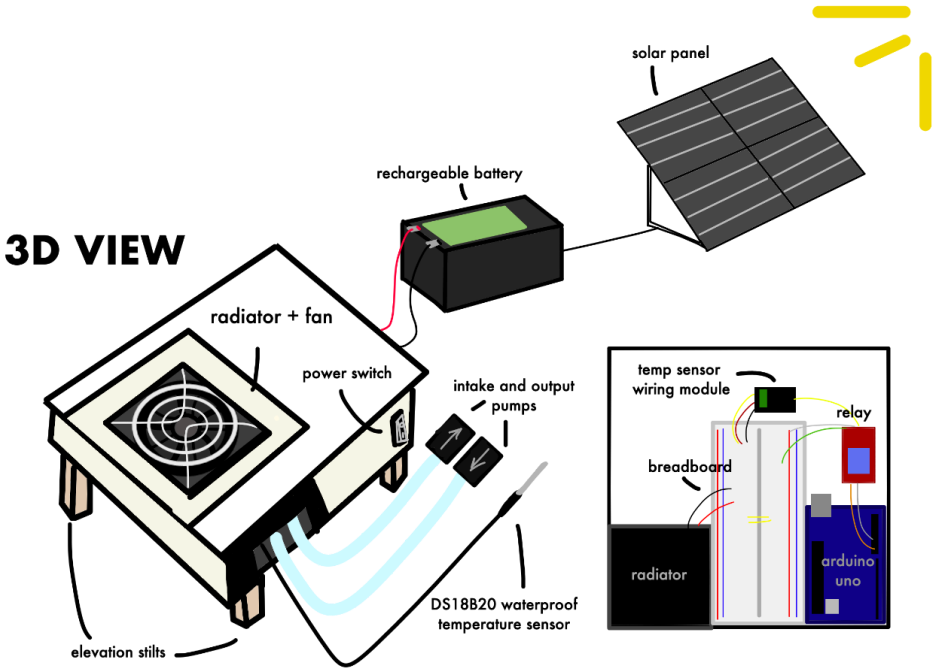
Our solution is ‘tofucool’ – a water temperature regulation system that relies on a pump-radiator loop.

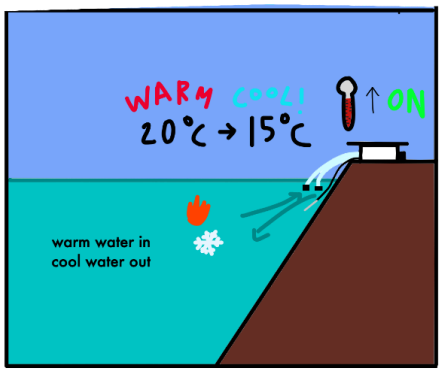
Key features:

- **Water pumps:** Circulates water from the water source into the radiator and back out.
- **Radiator:** Lowers the water temperature.
- **Waterproof temperature sensor:** Detects if water temperature exceeds our programmed limit.
- **Arduino Microcontroller:** This is used to automate the system using an initial setup as well as a loop code that checks for water temperature every second.
- **Rechargeable battery:** The battery will be hooked up to a solar controller and panel, providing environmentally sustainable power.
- **Sleek and compact design:** Easily modulable alongside water sources.

These features address Sonya’s needs. Tofucool offsets the thermal pollution caused by AI usage while simultaneously preserving the ecosystem, drinking water health, and sustainability standards. It can also be implemented at local and state parks, reservations, and irrigation systems. It offers a solution that’s scalable for Oregon communities and beyond.

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”


3D VIEW
solar panel
rechargeable battery
radiator + fan
power switch
intake and output pumps
elevation stilts
DS18B20 waterproof temperature sensor
temp sensor wiring module
relay
breadboard
radiator
arduino uno
INTERNAL VIEW


WARM
COOL
20°C → 15°C
ON
warm water in
cool water out

FIELD VIEW