The Duality of Deployment: Testing and Applying a Sun-Tracking Parabolic Dish System to Solar-Purify Contaminated Water in Different Community Structures

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Globally, 2 billion people rely on contaminated sources for drinking water. However, health interventions face a recurring issue: systems may be effective and accessible, yet fail to actually be adopted. The experiment was split into two goals: to successfully integrate a sun-tracking system to the dish that further lowers bacteria levels in water and to investigate what factors influence adoption related behaviors. The sun-tracking system used two gears to control the Zenith and Azimuth angles and two motors that would physically adjust the dish position. The code in the UAC converted sun angles into motor revolutions, executed trapezoidal motion for positioning, and repeated every minute to conserve energy. Sun-tracking consumed 67.23% less energy compared to last year's model; however, engineering challenges in prototyping suggest that long-term daily deployment requires more expensive materials. Surveys were given out to trained or untrained participants either individually or within families. Bacterial testing was done in a BS-1 lab using Petrifilm from samples purified by trained groups. Results showed a 99.1% reduction of bacteria and survey averages/qualitative responses indicated that family grouping may reduce the behavioral penalty of having no hands-on training. Correlational data identified seven statistical relationships, allowing for the student to create a behavioral framework called the Confidence Correlation Cat. Independent T-tests further revealed that families, regardless of training, predicted higher levels of preparedness compared to individuals. Where past health interventions fail at the deployment stage, this project explores how the duality of engineering and psychological sciences are needed to achieve tangible outcomes in the world.

Awards Won:

Arizona State University: Arizona State University ISEF Scholarship (valued at up to $32,000 each)

International Council on Systems Engineering - INCOSE: INCOSE Bill Ewald Socio-Technical Systems Engineering Award of $1000, a 1-year free student membership to INCOSE, and free virtual admission to this year's International Symposium of the INCOSE

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