Q2 Chapter Meeting

June 4, 2025 | Palomar College

WateReuse San Diego

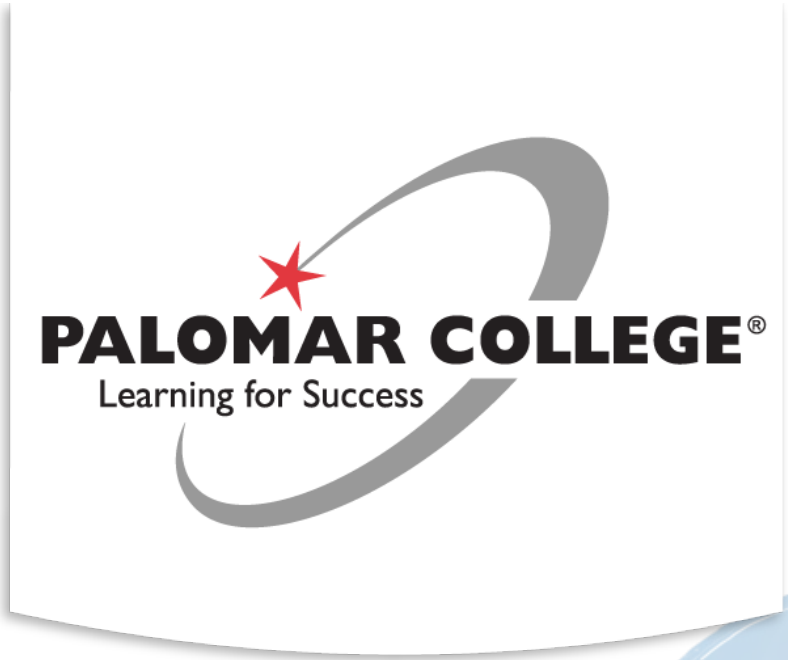
Welcome to our members! Please remember to sign-in!

Agenda

1. Welcome to Palomar College
2. Chapter Updates
   - Leg/Reg
   - Funding
   - Upcoming Events
3. GSDSEF Student Presentation
4. Internships & Alumni Experiences
5. Networking Roundtable
6. WateReuse CA Conference Student Raffle

WATEREUSE SAN DIEGO

Thank you to our host!



Chapter Updates

WateReuse San Diego Officers

WATEREUSE SAN DIEGO

2025 Officers

Past-President
Rosalyn Prickett
Rincon Consultants

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Trussell Technologies

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Antonia Estevez-Olea
West Coast Civil

Newsletter Editor
Shoshana Aguilar
City of Carlsbad

Chapter Representative
Lindsey Stephenson
Olivenhain MWD

WATEREUSE SAN DIEGO

Leg/Reg Update

WRCA Sponsored Senate Bill 31

- Would update Title 22 to expand use of tertiary recycled water
- Moving through with no opposition

SB 1157 Studies

- SB 1157 requires quantitative study of benefits and impacts of indoor water use standard
- DDW kicking off workgroup meetings this summer
- Report to SWRCB in 2028

Onsite Reuse Regulations

- SB 966 (2018) requires regulation for onsite treatment/reuse in multi-family and commercial buildings
- SWRCB held public hearing May 8
- Adoption planned for fall 2025

Cross-Connection Control Policy Handbook

- SWRCB adopted handbook in 2023, effective July 2024
- Cross-connection control plans due July 2025
- DDW proposed revisions to handbook. Comments due June 10, Hearing June 17

WATEREUSE SAN DIEGO

Funding - Federal Update

- President's May Draft Budget for FY 26 cuts all Recycled Water Funding for WaterSmart, Title XVI, and WIIN Act

WateReuse San Diego

Upcoming Events

REimagine
the possibilities

2025 WateReuse CA CONFERENCE
SAN DIEGO • CA
September 21-23, 2025

WATEREUSE SAN DIEGO

WateReuse Events

REimagine the possibilities

2025 WateReuse CA CONFERENCE
SAN DIEGO • CA
September 21-23, 2025

- Town & Country Hotel 9/21-9/23
- Registration
  - Early Bird thru 6/24
  - Advance thru 9/3
  - Hotel block rooms still available
- Please let us know (WateReuseSD@gmail.com) if you are interested in volunteering for the conference!
- WRSD Chapter Mixer hosted in partnership with Central Coast at the Monkey Bar 9/21 7-9 pm

WATEREUSE SAN DIEGO

WateReuse Events

Greater San Diego Science and Engineering Fair

- March 12, 2025
- Balboa Park Activity Center - 2145 Park Blvd, San Diego, CA 92101
- See Antonia if you are interested in volunteering next year!

GSDSEF Student Presentations

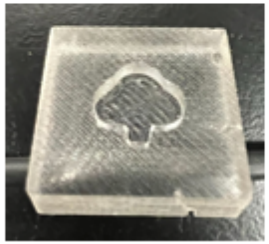
Steven Chen
Ashwin Mantra Vadi

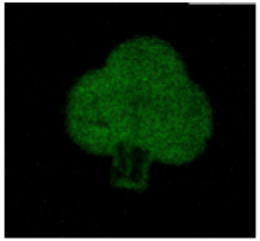
WATEREUSE SAN DIEGO

Nature-Inspired Living Device to Degrade Organic Pollutants in Water

Steven Chen

This project aims to develop a nature-inspired living device to degrade organic pollutants in water. Mimicking an underwater sea-fan, this living device uses hydrogel to encapsulate oxygen-generating live algae cells and iron oxide nanoparticles, allowing the Fenton reaction to degrade organic pollutants by generating reactive oxygen species. Two types of hydrogel and algae species were used to design the devices, which were tested against three major organic pollutants: chlorpyrifos (pesticide), tetracycline (antibiotic), and methylene blue (dye). The concentration of the pollutant was quantified by measuring each pollutant's UV absorbance with a TECAN plate reader. The results showed that regardless of hydrogel type and algae species, all devices were capable of degrading pollutants. By using naturally abundant materials like algae and fabricating a forest of such devices, the affordable device can efficiently operate at scale, with a wide variety of applications ranging from local environments to the confines of space travel.





Introduction

Conventional use of Fenton Reaction to degrade organic pollutants:

$$Fe^{3+} + H_2O_2 \rightarrow Fe^{2+} + HOO\bullet + H^+$$

$$HOO\bullet + \text{organic compounds} \rightarrow H_2O + CO_2$$

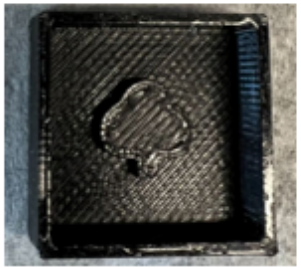
Nature-inspired living device to degrade organic pollutants:

Sea fan

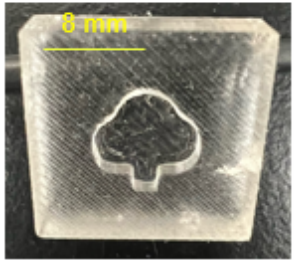
$$\text{Algae Photosynthesis} \rightarrow O_2$$

$$O_2 + 2H_2O \rightarrow 2H_2O_2$$

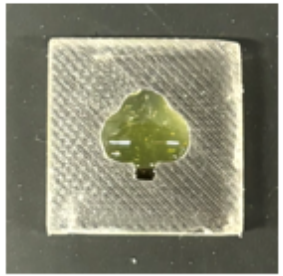
Device Fabrication:



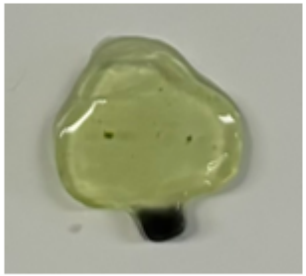
3D printed plastic mold



PDMS mold



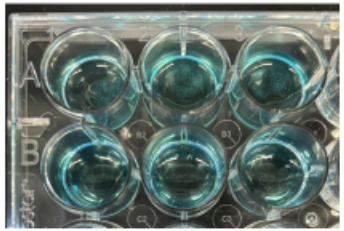
Fan with algae, stem with Fe_2O_3



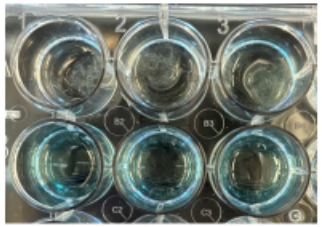
Released living device

- **2 types of hydrogel:**
  - Alginate Methacryoloyl (AlgMa)
  - Hyaluronic Acid (HA)
- **2 species of algae:**
  - *Arthrospira platensis* (spirulina)
  - *Chlamydomonas reinhardtii* (CR)
- **3 types of pollutants:**
  - Chlorpyrifos (pesticide)
  - Tetracycline (antibiotic)
  - Methylene Blue (industrial dye)

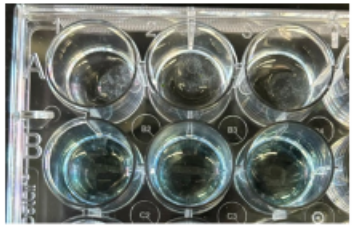
Major Results



Day 0



Day 1

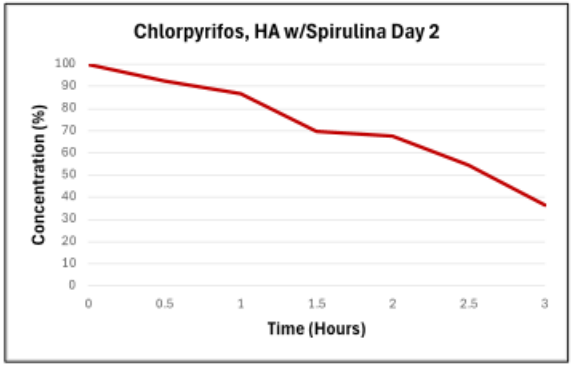


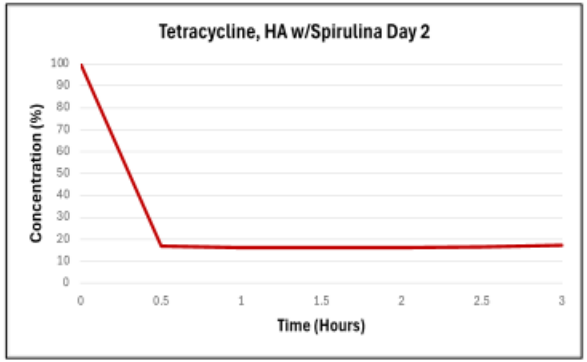
Day 2

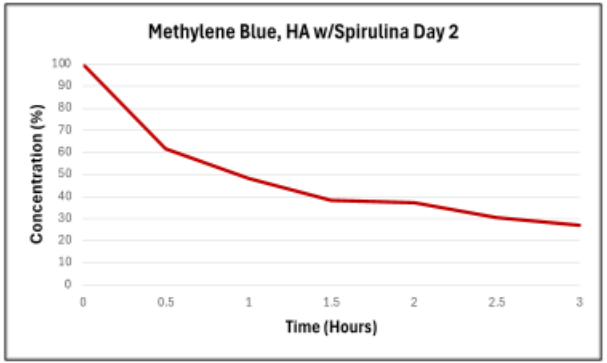
top row devices contain algae cells & iron oxide nanoparticles

bottom row devices with iron oxide nanoparticles only

Methylene blue dye was visually degraded by the living device (top row) in comparison to control (bottom row)







Using HA hydrogel with spirulina algae at 2 days of culture, after 3-hour degradation the pollutant concentration was reduced to:

Chlorpyrifos: 36.59%.

Tetracycline: 17.15%

Methylene Blue: 27.16%

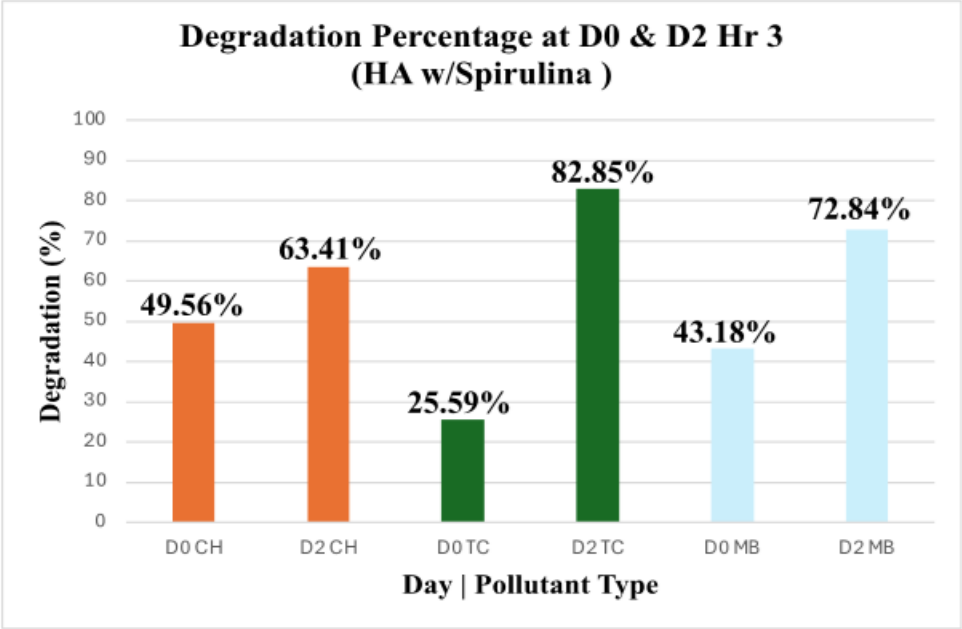
Discussion

There is a general degradation in pollutant concentration seen across all devices targeting all pollutants.

Note: Pollutant degradation is used in the following figures for analysis. Degradation = 100% - pollutant concentration.

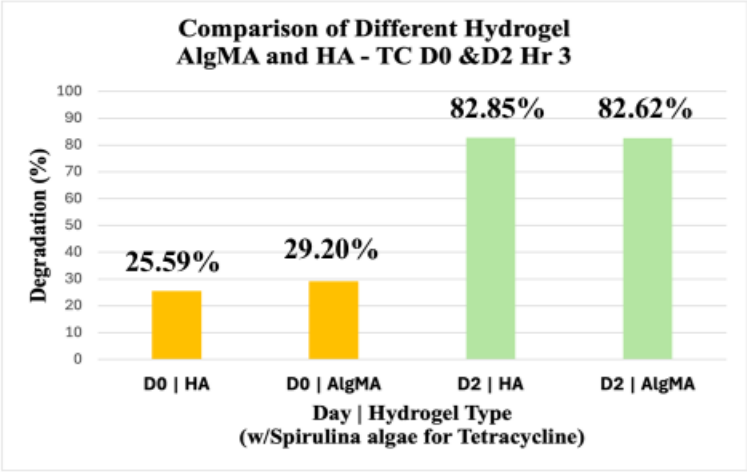
A) It has been shown that an increase in culture time (from Day 0 to Day 2) leads to better pollutant degradation (i.e. lower concentration), as seen in the figure on the right.

CH – Chlorpyrifos
TC – Tetracycline
MB – Methylene Blue
D0 – Day 0
D2 – Day 2

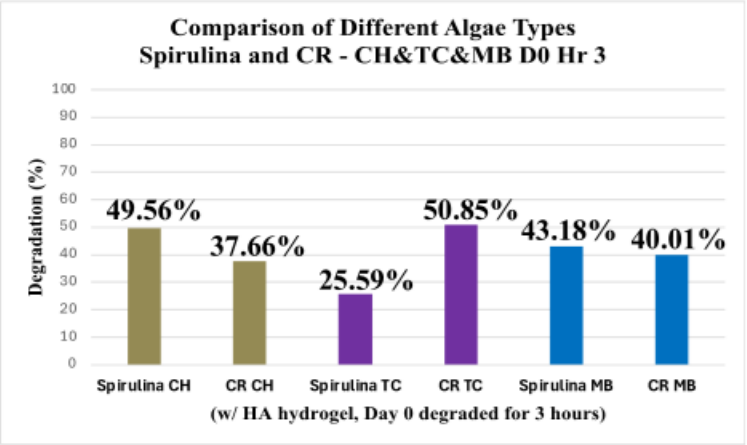


Discussion (continued)

B) Using different hydrogel types (HA and AlgMA) have similar effects on pollutant degradation, as shown on the right. This finding gives more flexibility in choosing which hydrogel to use for device fabrication.



C) From the testing of two different algae species (spirulina and CR algae) for pollutant degradation, spirulina was found to be more effective at degrading chlorpyrifos, while CR was found to be more effective at degrading tetracycline. Spirulina and CR performed similarly against methylene blue. This could be a guide in choosing the right algae or their combination to treat specific pollutants.

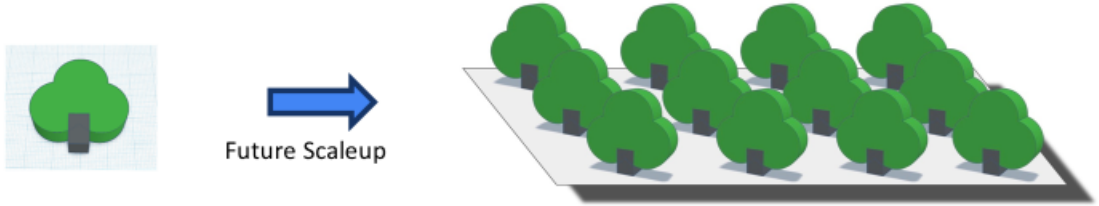


CH – Chlorpyrifos; TC – Tetracycline; MB – Methylene Blue; D0 – Day 0; D2 – Day 2

Conclusion

I believe that by optimizing the design, fabrication, and material composition of the living device, it can achieve a higher pollution degradation efficiency for targeted pollutants. In addition, by fabricating a forest of such devices, this technology can easily be scaled up.

This transformative work will lay down the foundation for the future of water pollution treatment.



Acknowledgements

I would like to thank Dr. Lisa Poulikakos at the University of California, San Diego for mentoring me for this science project. I also would like to thank my sister and my parents for their encouragement and help.

Thank you, San Diego Water Reuse Chapter, for supporting the GSDSEF!

From Awareness to Action: The Predictive Power of Knowledge and Attitudes on Microplastic-Reducing Behaviors and Practices

By Ashwin Mantra Vadi

Introduction

Research Question:

How do knowledge, attitudes, behaviors, and practices toward microplastics interact among community-dwelling individuals?

AIM: To investigate key predictors (knowledge and attitudes) of microplastic-reducing behaviors and practices to better design campaigns to invoke behavioral change.

Project Origin

This project began after reading a science article on microplastics, a problem I had not previously been aware of. Further research revealed that public awareness is low, despite growing scientific concern. Although I initially planned an intervention study, participant recruitment challenges led me to first explore the foundational relationships between knowledge, attitudes, practices and behaviors to support future efforts.

Work by others

Mahaliyana & Nugawela identified a major gap between scientific findings and public understanding, limiting behavioral change.

Yusuf & Elias found knowledge and perceptions were predictive of practices via multinomial regression models.

Caminiti et al. confirmed these associations in a broader, more generalizable context.

Methods

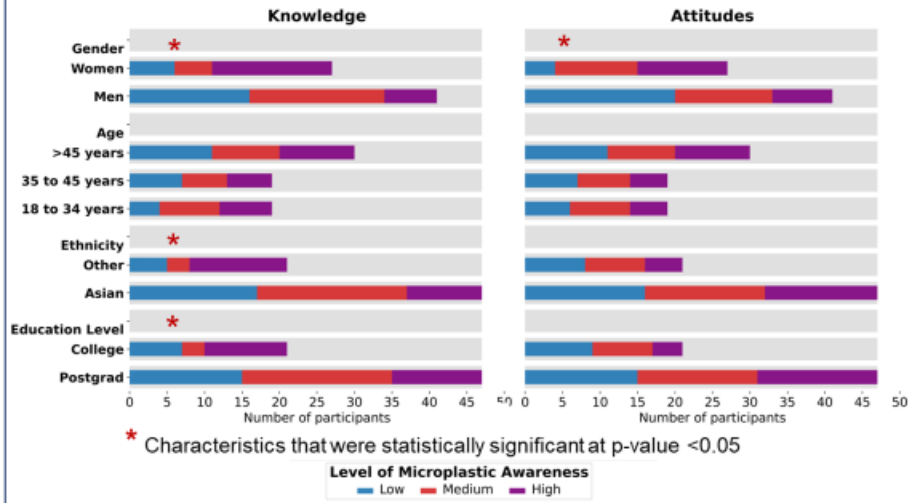
- A cross-sectional observational study was conducted among community members in the Greater San Diego district due to California's pioneering involvement in reducing plastic waste.
- The survey was created in Google Forms with questions adapted and modified from previous studies.
- The survey comprised of 6 different sections assessing the socioeconomic factors of the participants as well as their attitudes, knowledge, behaviors, and practices towards microplastics where behaviors was participant's willingness to engage in microplastic-reducing actions and practices was what they were currently doing. Social media usage was also assessed.
- The appropriate sample size for this study was calculated using the two-proportion formula by Lwanga & Lemeshow. To achieve an odds ratio between 1.1 and 4.0, with a 30% prevalence of the behavior, the required sample size ranged from 61 to 138 participants, ensuring an adequate study power of 80%.
- IRB approval was obtained before the recruitment of participants.
- Participants were selected randomly based on their residential address in 2 selected communities obtained from the Melissa Data Corporation.
- Participants were recruited at their front door and were offered a flyer with a QR code to scan and complete the survey.
- All participants were required to be above 18 years.
- Participants were asked for electronic consent at the very beginning of the survey and were informed that participation in this study was completely voluntary.

Statistical analysis methods

- Data cleaning and analysis was completed in Python using various statistical packages.
- A scale was created for each of the awareness sections (not including demographics) by giving a point for each correct answer and then tallying up the points for a total score for each participant.
- A weight was given to each answer to ensure that each question was equally weighted within that awareness category.
- The weighted microplastic awareness score was standardized to the mean to allow comparison between the different scales in regression models.
- Each weighted scale was categorized into tertiles (Tertile 1= Low, Tertile 2= Moderate and Tertile 3= High) and subsequently as Low vs Moderate to high for logistic regression analyses.
- Chi-square tests were performed to determine the association between the demographic characteristics and each component of the microplastic awareness scale and to identify covariates to adjust for as confounders in the regression models.
- Multinomial and Logistic regression models were performed to find associations between the predictors (knowledge and attitudes) and the outcomes (behaviors and practices).
- Bootstrapping 5,000 resamples with replacement was used to estimate the mediation effects and their confidence intervals (CI) to account for sampling variability and provide robust, data-driven inference without relying on normality assumptions.
- A p-value <0.05 was used to determine significant associations.

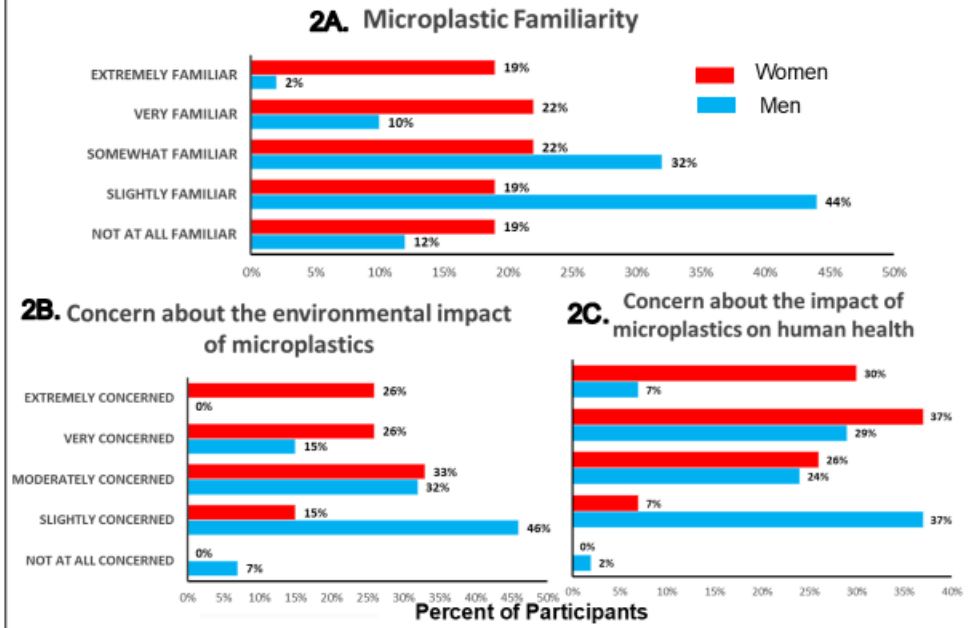
Results

Figure 1. Associations Between Demographic Traits and Tertile Knowledge and Attitude Categories



- Gender (p = 0.001) , Ethnicity (p = 0.038) and education level (p = 0.004) was significantly associated with knowledge levels and only Gender with attitude level (p = 0.01),
- No significant associations were found between demographic characteristics and microplastic reducing behaviors or practices.

Figure 2. Significant Gender differences in Microplastic Familiarity and Concerns about its Environmental and Health Impacts.



- Men report lower familiarity with microplastics compared to women (Fig 2A, p-value = 0.032).
- Women had higher concern towards the environmental impact of microplastics (Fig 2B, p-value = 0.001) and health implications (Fig 2C, p-value = 0.0212) compared to men.

Results: Multinomial Logistic Regression Models

Predicted Probability of Low, Moderate, and High Microplastic-Reducing Behaviors

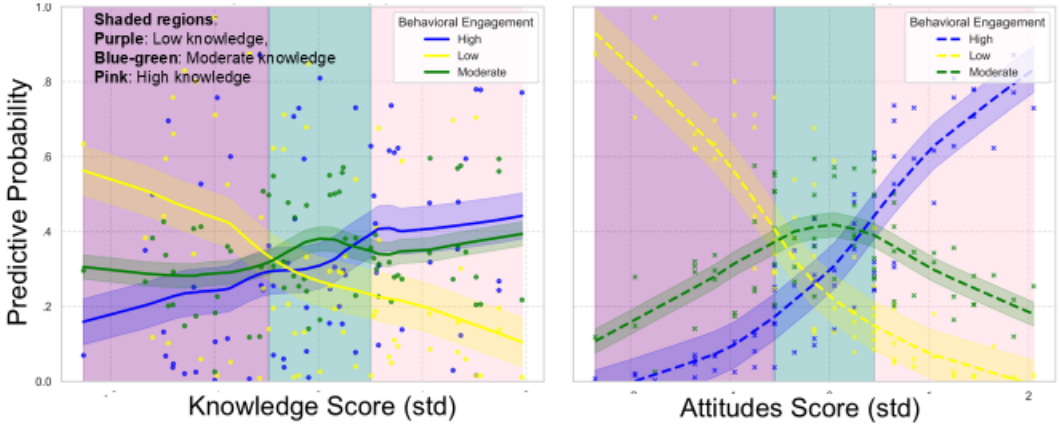


Figure 3. Relationship between knowledge, attitudes, and behavioral engagement. The left graph illustrates that as knowledge increases, the probability of low behavioral engagement (yellow line) decreases, while high engagement (blue line) gently increases. The right graph shows that favorable attitudes sharply decrease low behavioral engagement (dashed yellow line) and significantly increase high engagement (dashed blue line).

Predicted Probability of Low, Moderate, and High Microplastic-Reducing Practices

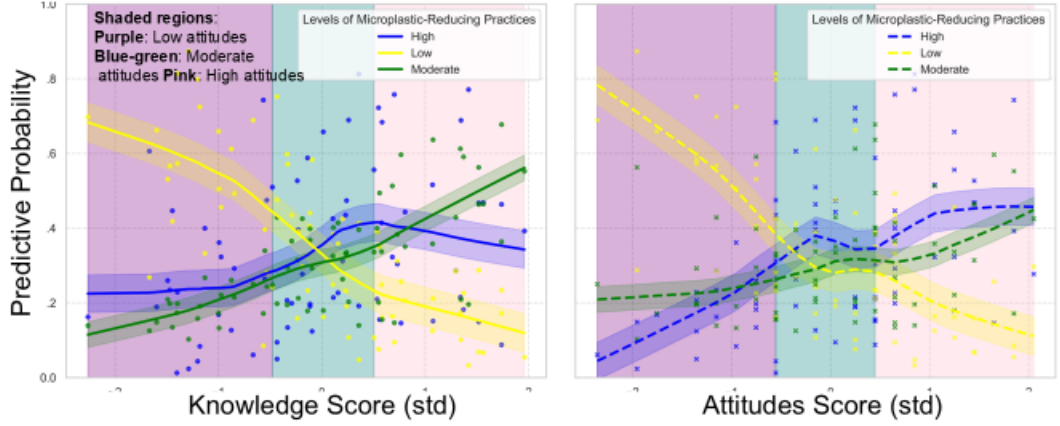


Figure 4. Relationship between knowledge, attitudes, and microplastic-reducing practices

As knowledge awareness increases, the probability of engaging in low practices (yellow line) decline (left graph).The right graph displays a similar trend for attitudes awareness. High practices (blue line) remain relatively stable in both cases.

Results: Predictive Power of Attitudes and Knowledge on Practices and Behaviors using Logistic Regression Models

Predictors	Level of Behaviors Low vs Moderate to High		Level of Practices Low vs Moderate to High	
Model	**Odds Ratio (95%CI)**	**p-value**	**Odds Ratio (95%CI)**	**p-value**
Knowledge				
Low vs Moderate/High	2.02 (0.4 , 10.14)	0.395	5.1 (1.34 , 19.22)	0.017
Attitudes				
Low vs Moderate/High	65.07 (8.05 , 525.84)	<0.0001	3.66 (1.03 , 13.07)	0.046
Education level				
Postgraduate vs. Bachelors	0.84 (0.12 , 5.72)	0.857	0.54 (0.12 , 2.4)	0.418
Race				
White vs Asian	1.25 (0.19 , 8.27)	0.818	2.95 (0.6 , 14.41)	0.182
Gender				
Women vs Males	0.23 (0.04 , 1.48)	0.121	1.79 (0.47 , 6.85)	0.397
Age				
45+ vs <35	0.1 (0.01 , 0.73)	0.024	0.26 (0.05 , 1.2)	0.084
35-45 vs <35	0.09 (0.01 , 0.8)	0.031	0.76 (0.16 , 3.6)	0.732

Table 1: Odds Ratios and 95% Confidence Intervals (CI) of the Predictors of Microplastic reducing Behaviors and Practices. Significant predictors are highlighted.

Attitudinal level was the strongest predictor of behavioral engagement, while knowledge level was only associated with microplastic reducing practices. Older adults have less odds of low behavioral engagement.

Mediation effects on the Knowledge-Practices relationship using Bootstrapping techniques for robust estimates

Table 3. Mediation Analysis of Attitudes on the Knowledge–Practice Relationship

	Path	Effect type	Estimate	Odds ratio (95%CI)	p-value
1	Knowledge → Attitudes	a (Knowledge on Mediator)	1.27	3.56 (1.18 to 10.77)	0.025
2	Attitudes → Practices	b (Mediator on Practices)	1.71	5.53 (1.76 to 17.34)	0.003
3	Knowledge → Practices	c' (Knowledge on Practices direct)	1.88	6.54 (1.91 to 22.4)	0.003
4	Indirect (a x b)	Mediation Effect	1.8	6.03 (1.03 to 95.65)	0.044

Path 1: Knowledge significantly influences attitudes, with an odds ratio of 3.56.
Path 2: Attitudes, acting as a mediator, strongly affect practices, with an odds ratio of 5.53.
Path 3: The direct effect of knowledge on practices remains significant (c' path), with an odds ratio of 6.54.
Path 4: The indirect effect (a × b), representing the mediation effect, is significant with an odds ratio of 6.03 (95% CI: 1.03 to 95.65) and a p-value of 0.044, suggesting partial mediation by attitudes.

This table presents the results of a mediation analysis examining the role of attitudes in the relationship between knowledge and practices. Models were adjusted for age, race and education level. Gender was not adjusted in models to investigate mediation of attitudes on knowledge and practices since gender was not associated with practices in logistic regression models

Discussion

Directed Acyclic Graph (DAG)

Figure 5. DAG illustrating the relationships between knowledge, attitudes, behaviors and practices related to microplastics. Solid red arrows indicate direct effects of demographic variables (age, gender, education) on knowledge and attitudes. Solid blue arrows indicate the direct effects of knowledge on practices and of attitudes on practices and behaviors, independent of mediation. Green dashed arrows represent the mediation pathway, where knowledge influences practices through attitudes.

Two distinct pathways were identified in shaping responses to microplastics:

1. Knowledge leads to improved practices, both directly and indirectly by enhancing attitudes.
2. Attitudes as the Key Driver of Behavior Change, independent of knowledge.

This study aligns with Yusuf et al., who found a strong association between attitudes and practices (OR: 2732 x 10^6) among Malaysian subjects. However, unlike this study, they did not find knowledge to be a significant predictor of practices, nor did they explore attitudes as a mediator in the Knowledge-Practices relationship.

Several studies from different countries have reported similar attitude-practice relationships, suggesting this trend is consistent across different cultures and governance structures.

Discussion

Gender Differences in Awareness

- Women exhibited greater knowledge and more positive attitudes toward microplastics, likely due to increased exposure to environmental messaging, heightened risk perception, and more sustainability-focused purchasing habits. This trend has been consistently reported in multiple studies, highlighting the need for further research on which aspects of awareness resonate most with men to help bridge the gender gap.
- Two national surveys focusing on environmental risks analyzed by Richard J. Bord and Robert E. O'Connor found that when a population is informed about the health risks associated with environmental issues, the gender gap in attitudes disappears, with both men and women developing more positive environmental attitudes. This highlights the need for campaigns that emphasize health-related impacts to effectively engage both genders in environmental concerns.

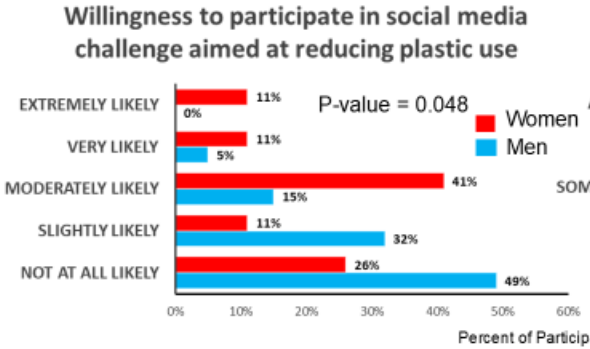
Limitations :

An unexpected challenge during recruitment was the difficulty of obtaining participants through a door-to-door approach. Many individuals were either unavailable or unwilling to participate, resulting in a smaller-than-ideal sample size. Additionally, the recruited participants were predominantly from a high-income, well-educated Asian community, which limits the broader applicability and generalizability of the findings to more diverse populations.

Conclusion

This study uniquely highlights attitudinal change as the primary driver of behavioral shifts toward microplastic reduction. Attitudes play a crucial role in fostering better practices, with knowledge serving as a prerequisite for attitudinal improvement. Since the link between knowledge and attitudes is largely influenced by gender, tailored educational strategies that align with gender-specific interests are crucial. By prioritizing knowledge-building efforts that effectively target different demographic groups, awareness campaigns can foster attitudinal shifts that drive sustainable and impactful behavioral change.

Future Work: Social Media Driven Campaigns



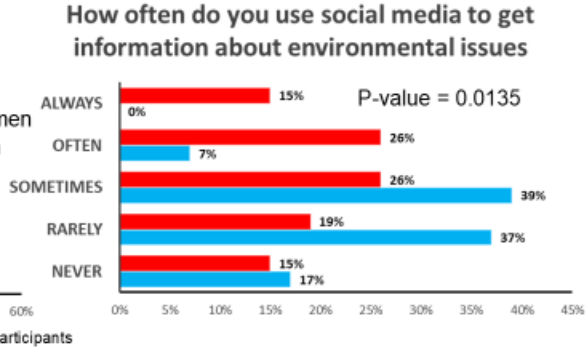


Figure 6 displays the percent of women are more likely willing to participate in a social media challenge for reducing plastic use compared to men

Figure 7 displays the % women use of social media for information on environmental issues compared to men

Our findings highlight the importance of gender-specific messaging, as women showed greater concern about environmental and health impacts. Campaigns targeting women should emphasize these aspects, with social media emerging as a particularly effective platform for outreach and interventions.
Future studies should explore optimal platforms and content strategies for engaging men, as well as identify gender-specific gaps in knowledge and attitudes to guide tailored campaign development.

Thank you for listening

Palomar College Water and Wastewater Technology Program

Jacob Shiba, Palomar College

WATEREUSE SAN DIEGO

Palomar's Water Technology Program

- Legacy program started over 50 years ago
- Associate and Certificates in Water and Wastewater Tech.
- One full-time faulty and 9 adjunct faculty
- Work directly with our local industry
- Offer 12 courses each semester in a hybrid format
  - In-person night classes
  - Hybrid classes
  - Hyflex classes
  - Fully online with Zoom

Water Technology Classroom

Current Courses

- Fundamentals
- Career Pathways
- Calculations
- Water Distribution I
- Water Treatment
- Wastewater Treatment
- Wastewater Collections
- Instrumentation
- Backflow
- Lab Analysis
- Pumps, Motors, and Hydraulics
- Public Works Management
- Water Conservation
- Safety
- Advanced Plant Operations: Water Treatment
- Advanced Plant Operations: Wastewater Treatment
- Water Distribution II

San Diego Regional Water/Wastewater Internship Program

Patricia Duran, San Diego County Water Authority

WateReuse SAN DIEGO

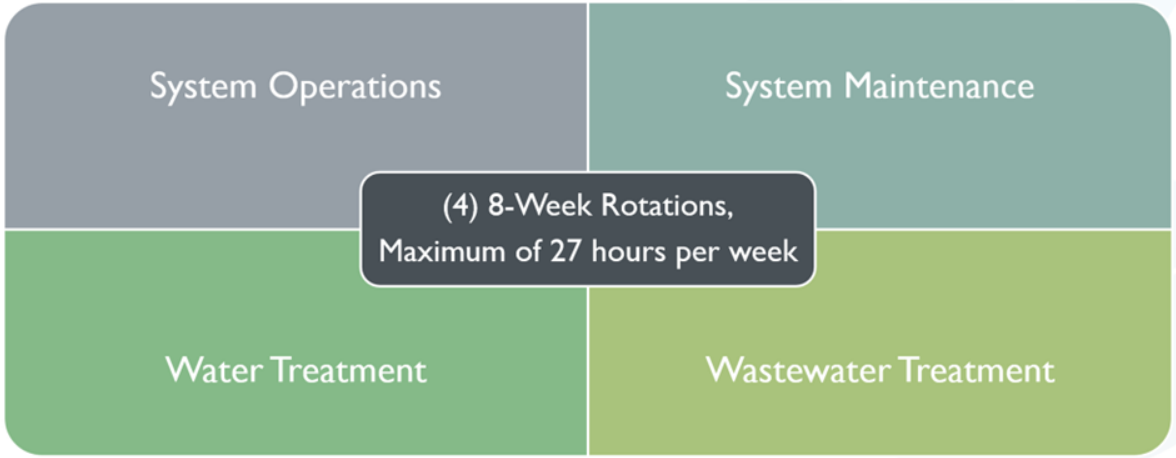
San Diego County Water Authority

Regional Water/Wastewater Internship Program

Patricia Duran, Senior Human Resources Analyst

Regional Water/Wastewater Internship Program

- Created in 2006, partnership with regional water agencies, private sector, and community colleges.
- Goal: to provide a talent pipeline of potential, entry-level candidates in the water and wastewater industry.
- Paid interns are placed with participating member agencies and partners for four eight-week rotations.



2025-2026 Participating Agencies

1. City of Poway
2. Olivenhain Municipal Water District
3. Otay Water District
4. Padre Dam Municipal Water District
5. San Elijo Joint Powers Authority
6. Vallecitos Water District
7. San Diego County Water Authority

Internship Program Schedule

MANDATORY ORIENTATION

Quarter 1
08/18/25 – 10/10/25

Quarter 2
10/13/25 – 12/12/25

WINTER BREAK
12/15/25 – 02/01/25

Quarter 3
02/02/26 – 03/27/26

Quarter 4
04/06/26 – 05/29/26

APPLICATION & SELECTION PROCESS

- Students apply online at www.sandiegowaterworks.org during the annual application window.
- Applications are screened by SDCWA Human Resources staff for minimum qualifications.
- Applications are forwarded to a subcommittee to identify the top candidates for interviews.
- Selected candidates are invited to interview with a panel comprised of participating agencies and representative from Cuyamaca and Palomar College.
- Selections are made by the panel.

Interview Tips

🔍 **Understand the Position**
Know what the position does, who they will be working with and expectations.

🦺 **Emphasize Safety Awareness**
Discuss safe work habits and experience working in tough conditions.

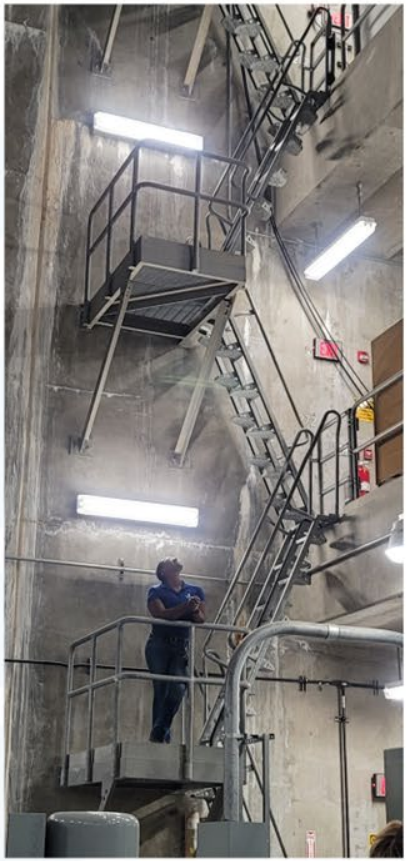
🔧 **Showcase Hands-On Experience**
Mention use of tools, physical labor, and maintenance tasks.

🔁 **Highlight Transferable Skills**
Teamwork, problem-solving, safe driving, and communication.

🎓 **Mention Education & Certifications**
Include relevant coursework or upcoming state exams.

💬 **Practice Scenario-Based Questions**
Prepare examples of how you handled issues or emergencies.

👔 **Be Professional & On Time**
Dress appropriately and arrive early.



Set Yourself Up for Success

- **Punctuality & Reliability:** Show up on time, every time. Dependability builds trust and shows respect for the job.
- **Strong Work Ethic:** Take initiative, stay focused, and give your best effort.
- **Commitment to Safety:** Follow all safety rules and procedures. Look out for your own safety and that of your team.
- **Willingness to Learn:** Ask questions, accept feedback, and stay open to new skills and knowledge.
- **Adaptability to Change:** Stay flexible and open-minded when processes, tools, or assignments shift.
- **Teamwork & Communication:** Work well with others, listen actively, and communicate clearly and respectfully.
- **Positive Attitude:** Stay respectful, adaptable, and solution-focused—even during challenges.
- **Networking:** Build professional relationships with coworkers, supervisors, and industry contacts. These connections can lead to future opportunities.

Thank You!

@sdcwa

SanDiegoCountyWaterAuthority

@sdcwa

San Diego County Water Authority

Alumni Experiences

Evan DeWindt, Olivenhain Municipal Water District

Brandon Barnick, Olivenhain Municipal Water District

WateReuse SAN DIEGO

San Elijo Joint Powers Authority Internship Program

Mike Thornton, San Elijo Joint Powers Authority
Kevin Lang, San Elijo Joint Powers Authority

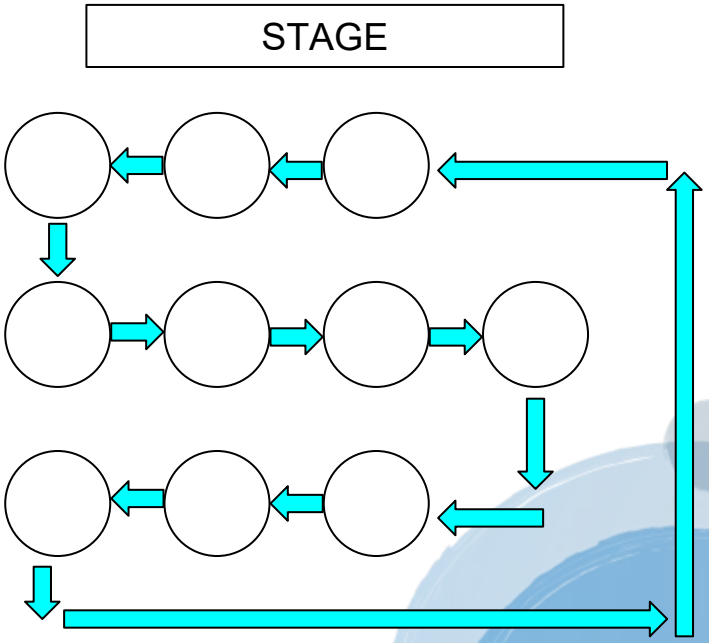
WATEREUSE SAN DIEGO

Networking Roundtable

WATEREUSE SAN DIEGO

Networking Roundtable

- Tables of ~3 students with ~3 professionals
- Each session is 8 minutes with 1 minute for transition time
- Start with a quick round of introductions
- Use the prompt questions provided at your table for inspiration!
- Students rotate tables, professionals remain at their assigned tables



WateReuse CA Conference Student Raffle!

(September 21-23 at Town & Country in San Diego)

WATEREUSE SAN DIEGO