AEESP Foundation Grant

Final Report

Introducing High School Students and Teachers to Environmental Nanotechnology Through Hands-on Activities

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I. Abstract:
The activity goals were to 1) introduce new fields in environmental engineering to local Miami-Dade high-school students and teachers, especially women and minorities, as a means of heightening their interest in STEM; 2) provide the University of Miami Engineering undergraduate students an opportunity to develop their communication and leadership skills while mentoring high-school students. Dr. Joo hosted a workshop on environmental nanotechnology as part of her efforts to increase student populations in STEM. In the workshop, the PI invited high-school students as well as teachers from Miami-Dade County Public Schools (MDCPS) and exposed them to cutting-edge nanoscience research, hands-on learning experiences, and computational simulations as a means to pique their interest in nanoscience. Additionally, undergraduate and graduate engineering students served as mentors during the workshop, which provided them a means to develop their professional communication and leadership skills. For measuring the outcome of the workshop, an exit survey was conducted and attached to this final report. As can be seen in the exit survey, the workshop had a significant impact, thus exposing teachers and students to the new field of environmental engineering and sciences, particularly motivating high-school students to consider college education in environmental engineering.

II. Activities performed in the workshop: The activities performed in the workshop are shown in the following flyer of the workshop held at the Universit of Miami on Saturday, April 29, 2017.

Table 1. Workshop flyer

Workshop Flyer	
Welcome address	10:30–11:00 am
Guest speaker presentation (Mr. Juan Aceituno at CH2M)	11:00–12:00 pm
Lunch and Networking	12:00–1:30 pm
Lab tour and synthesis of Fe (0) NPs using a tea extract	1:30–2:00 pm
Poster presentation by two graduate students	2:00–2:30 pm
STEM higher education for the future	2:30–3:00 pm
Q&A as well as assessment and photographs	3:00–4:00 pm

Contents: In the workshop, the following contents were provided;

♦ Speaker presentation: Basic sciences applied to water and wastewater engineering and its resultant impact on the public were presented.

♦ Hands-on experiences (e.g., greener synthesis of nanomaterials) were provided during lab tours of the state-of-the-art research facilities.

♦ The workshop also had an exhibition on recent nanotechnology-featuring posters and presentations by the graduate students.

♦ A discussion session on the future of nanotechnology applied to the environment and environmental engineering/science in general concluded the workshop.

♦ Undergraduate students mentored high-school students and engaged in discussion about their research experiences, college courses, and extracurricular activities.

 # Photos showing the aforementioned activites are below.

Lab tour and student's hands-on experiences

Graduate student's poster presentation

Welcome address by Dr. Joo

Guest speaker, Mr. Juan Aceituno at CH2M

Concluding the workshop...

III. Outcomes and future prospects

The workshop was successfully completed, and, as indicated in the exit survey, there was considerable interest in it, and all the participants, including teachers and students, expressed that the workshop intensified their motivation and they had a great learning experience in this area and learned more about environmental engineering and science. Further, the participants indicated that this type of workshop should be provided more often in the future. The workshop also offered undergraduate students a means to develop their professional communication and leadership skills, thus piquing their interest in nanoscience. Participating high-school students and teachers had the opportunity to interact with undergraduate and graduate students as well as faculty in the field. An industry collaborator from CH2M Company gave a talk on basic sciences applied to water and wastewater engineering as well as the implication of nanotechnology to water treatment and reuse. Finally, a discussion session on the future of nanotechnology concluded the workshop. Additionally, the forum on the future of nanotechnology as a means of highlighting future exciting research directions was held. Environmental problems that we face globally and approaches to resolving such challenging issues by applying emerging technologies such as nanotechnology were discussed throughout the workshop. Advances in these emerging fields could assist in the resolution of environmental problems both locally and globally through excellent education in STEM and through developing the next generation of engineers and scientists in these fields. Overall, I am pleased to see such a great outcome from this workshop and hope to have further opportunities for hosting workshops in the near future.

Acknowledgment Funding was provided by the Association of Environmental Engineering and Science Professors (AEESP) Foundation.

WORKSHOP EXIT SURVEY

1. Please rate the overall usefulness of this workshop

Response Item	Your Response (√) Choose one
Very Useful	✓
Useful	
Of Little Use	
Not useful at all	
No opinion	

2. To what extent was this workshop effective in increasing your understanding of the topic?

Response Item	Your Response (√) Choose one
Very Effective	✓
Effective	
Somewhat Effective	
Not Very Effective	
Not Sure	

3. What was the most valuable aspect of the workshop? Why?

Overall workshop - learned new things and excited about what is happening!

4. Other constructive comments?

Excellent workshop with valuable information.

WORKSHOP EXIT SURVEY

1. Please rate the overall usefulness of this workshop

Response Item	Your Response (√) Choose one
Very Useful	√
Useful	
Of Little Use	
Not useful at all	
No opinion	

2. To what extent was this workshop effective in increasing your understanding of the topic?

Response Item	Your Response (√) Choose one
Very Effective	√
Effective	
Somewhat Effective	
Not Very Effective	
Not Sure	

3. What was the most valuable aspect of the workshop? Why?

Extremely informational and ~~extra~~ interesting presentation, I loved it! Everyone was so ~~kidding~~ kind

4. Other constructive comments?

Thank you for a wonderful workshop! (and the sandwiches)

WORKSHOP EXIT SURVEY

1. Please rate the overall usefulness of this workshop

Response Item	Your Response (√) Choose one
Very Useful	✓
Useful	
Of Little Use	
Not useful at all	
No opinion	

2. To what extent was this workshop effective in increasing your understanding of the topic?

Response Item	Your Response (√) Choose one
Very Effective	✓
Effective	
Somewhat Effective	
Not Very Effective	
Not Sure	

3. What was the most valuable aspect of the workshop? Why?

Real world speaker + the talk on water. it applied to me and the the world around me

4. Other constructive comments?

Thank you. it was great!

WORKSHOP EXIT SURVEY

1. Please rate the overall usefulness of this workshop

Response Item	Your Response (√) Choose one
Very Useful	✓
Useful	
Of Little Use	
Not useful at all	
No opinion	

2. To what extent was this workshop effective in increasing your understanding of the topic?

Response Item	Your Response (√) Choose one
Very Effective	✓
Effective	
Somewhat Effective	
Not Very Effective	
Not Sure	

3. What was the most valuable aspect of the workshop? Why?

Really informative listening to the industry guest speaker

4. Other constructive comments?

Would love for more opportunities for lab tours of engineering

WORKSHOP EXIT SURVEY

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Very Useful	✓
Useful	
Of Little Use	
Not useful at all	
No opinion	

2. To what extent was this workshop effective in increasing your understanding of the topic?

Response Item	Your Response (√) Choose one
Very Effective	✓
Effective	
Somewhat Effective	
Not Very Effective	
Not Sure	

3. What was the most valuable aspect of the workshop? Why?

real information based on real world experiences

4. Other constructive comments?

enjoyed

WORKSHOP EXIT SURVEY

1. Please rate the overall usefulness of this workshop

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Very Useful	✓
Useful	
Of Little Use	
Not useful at all	
No opinion	

2. To what extent was this workshop effective in increasing your understanding of the topic?

Response Item	Your Response (√) Choose one
Very Effective	✓
Effective	
Somewhat Effective	
Not Very Effective	
Not Sure	

3. What was the most valuable aspect of the workshop? Why?

This was a great workshop! I learned a ton! Thanks again! The topics were very informative! nanotechnology is very interesting!

4. Other constructive comments?

Would like to know more about nano technology

WORKSHOP EXIT SURVEY

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Very Useful	✓
Useful	
Of Little Use	
Not useful at all	
No opinion	

2. To what extent was this workshop effective in increasing your understanding of the topic?

Response Item	Your Response (√) Choose one
Very Effective	✓
Effective	
Somewhat Effective	
Not Very Effective	
Not Sure	

3. What was the most valuable aspect of the workshop? Why?

Presentations, networking.

4. Other constructive comments?

WORKSHOP EXIT SURVEY

1. Please rate the overall usefulness of this workshop

Response Item	Your Response (√) Choose one
Very Useful	√
Useful	
Of Little Use	
Not useful at all	
No opinion	

2. To what extent was this workshop effective in increasing your understanding of the topic?

Response Item	Your Response (√) Choose one
Very Effective	√
Effective	
Somewhat Effective	
Not Very Effective	
Not Sure	

3. What was the most valuable aspect of the workshop? Why?

Everything B
D

4. Other constructive comments?

WORKSHOP EXIT SURVEY

1. Please rate the overall usefulness of this workshop

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Very Useful	✓
Useful	
Of Little Use	
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Very Effective	✓
Effective	
Somewhat Effective	
Not Very Effective	
Not Sure	

3. What was the most valuable aspect of the workshop? Why?

Insight from EE Professor and CH2M.

4. Other constructive comments?