Community Connections Challenge

Oregon State University - 2024

MECC Outreach Team

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Introduction

The Oregon State University (OSU) Marine Energy Collegiate Competition (MECC) Team is a multidisciplinary, undergraduate team passionate about the development of holistic marine energy solutions. Our team is composed of two groups, a team of seniors using the MECC to complete their engineering capstone project, and a team of juniors and seniors who focused on the "Community Connections Competition." One of our central objectives is to develop a positive marine energy community at Oregon State, and to spread marine energy interest to our broader community. Networking events hosted by our "Marine Renewable Energy Club," visibility through social media and the school newspaper, and local K-12 educational events provide avenues for the OSU MECC teams to achieve our goals.

K-12 Education Objective

The OSU team chose to focus on marine energy education for the MECC "Community Connections Challenge." We set out to create an engaging lesson plan that follows Oregon's grade school level science requirements. Introducing marine energy into the K-12 school system can strengthen students' understanding of the engineering process and environmental justice concepts. The ever-growing demand for clean energy has made it critical to get young students excited about marine energy. Encouraging early enthusiasm will help the marine energy field grow.

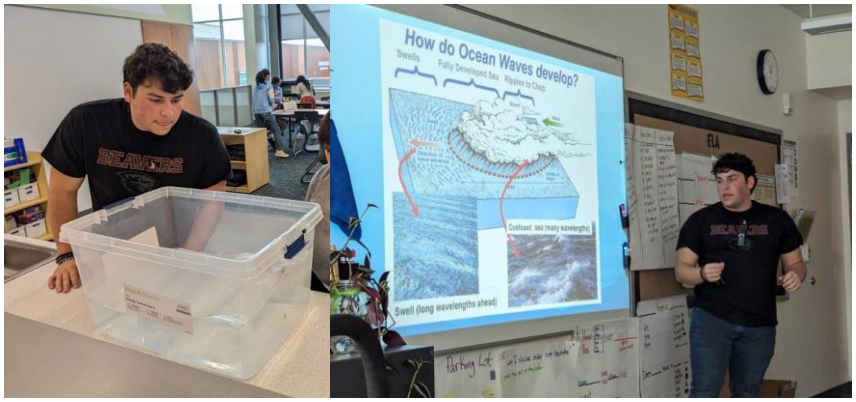
It is important to highlight the practices and culture of coastal communities in marine energy education. Often STEM education only focuses on how to technically design a product. Our educational content must consider how new technologies could impact the environment and local community. Students are eager to learn about novel technology like wave energy, which creates an important early passion for engineering. The OSU MECC team worked with professionals from education and oceanography to ensure that our material was technically accurate and engaging for a diversity of students. First, our team reached out to KidWind, a company that provides free renewable energy lesson plans for a range of education levels, to discuss the possibility of collaborating on a lesson plan for the company. KidWind has a

plethora of lesson plans for wind and solar energy but lacks wave energy educational resources. After a conversation with Micheal Arquin, we decided it was optimal to focus on creating a lesson plan aimed at a grades 4th through 6th.

Our first step towards creating an educational plan was running a trial educational program in a fourth-grade classroom. In this lesson plan, fourth graders were taught about the basics of wave energy, what infrastructure is required, and the engineering process. This program also included a physical buoyance experiment allowing kids to experiment with different weights and materials to conduct their own experiments.

Taking what we learned from our fourth-grade education session, we hosted a clinic at the Oregon Sea Grant's Renewable Energy Challenge, a competitive educational event held for elementary to middle school students from all over Oregon. This event is held at the Hatfield Marine Science Center in Newport, Oregon and has students testing devices that they built. After testing their renewable energy devices, the students would come to us for a 30-minute presentation and activity about marine energy. This event helped us tune our education plan goals. Hosting our workshop showed us we needed to better structure our lesson plan for educators not well-versed in marine energy. At the end of each workshop, teachers and parents had questions about our material in areas we could have articulated better. While we found that there was enough background for the students to understand during a lesson, educators might have had a tougher time with the resources provided.

The team's main challenge in designing the education plan was turning high-level literature into an accessible format for the average elementary student and teacher. An educator new to marine energy should be able to lead a lesson. It was important to educate both the teachers and students on the process without using complex words and terms beyond their comprehension. Even once we could teach the material in more digestible ways, keeping students interested in the material was almost an even bigger hurdle. We were able to overcome this by making sure they were involved in the content and could get up and move around. From moving their bodies like different types of WECS (Wave Energy Converter) to making their own mini version of our project!



A team member of MECC teaching a physical buoyancy activity to a class of fourth graders.

Oregon State MECC team taught over 50 teams of kids at the Oregon Coast Renewable Energy Challenge.

Industry Interview Outcomes

This year, we interviewed five different professionals with ranging fields of expertise. Each interview was attended by six team members on average, each of whom compiled questions for and participated in the conversations with the interviewees.

Oregon Sea Grant (Cait Goodwin, Lindsay Carroll, Tracy Crews)
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Cait Goodwin, Lindsay Carroll, and Tracy Crew from the Oregon State University (OSU) Oregon Sea Grant Extension met with our team to discuss K-12 renewable energy education and the value of well-structured, hands-on, educational events. We learned that educators are working to incorporate engineering and renewable energy principles into core curricula but are hindered by a lack of resources. There are barely any available marine energy educational resources. Through this connection, we were able to partner with them and offer a solution within our community and teach our education presentation at an event for renewable energy!

Michael Arquin: Kidwind
michael@kidwind.org

Michael Arquin is the CEO of KidWind, a company developing resources for renewable energy education. Mr. Arquin has experience planning educational events. He emphasized the importance of pushing students to apply their knowledge, which needs a complete understanding of the target student's learning level. Mr. Arquin offered to work with our team to develop wave energy education kits. The progress we have made with him is something we plan on continuing next year to have a fully functional kit and teaching curriculum.

Dr. Kelsey Emard
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Dr. Kelsey Emard is a professor at Oregon State University who specializes in political ecology and environmental justice. Dr. Emard believes that engineers must be mindful of placing renewable energy projects in locations that are convenient for the company without considering the people and community that could be affected. As an example, Dr. Emard discussed an offshore wind development that is inadvertently shrinking the borders of a tribal marine sanctuary.

Dr. Burke Hales
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Dr. Burke Hales is the Chief Scientist of PacWave, an open ocean wave energy testing site managed by Oregon State. Dr. Hales discussed the key issues hindering oceanographic research. Cost is paramount, and any wave energy power system must have extensive proof that it is worth the added expense. Dr. Hales encouraged WEC developers to work with

oceanographic research teams looking to extend the lifetime of their deployment. Dr. Hales also emphasized the importance of designing and testing a WEC for survivability in real ocean conditions.

Dr. Kipp Shearman
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Dr. Kipp Shearman is a physical oceanographer at Oregon State University who researches the interaction of fronts with the coastal ocean. Much of Dr. Shearman's research is conducted with observation vessels and gliders. Gliders depend on rechargeable batteries, are notorious for power issues, and a failure can cost thousands of dollars. Dr. Shearman expressed interest in integrating WEC technology with an observation glider to extend its lifetime and suggested that long-term oceanographic projects would be the best market for our team's WEC device.

Action Outcomes for Activities or Events

Our team's outreach goal for this year was met by hosting our educational activities both on a smaller scale in a classroom and during the Oregon Coast Renewable Energy Challenge. In the classroom we were able to teach 24 kids about buoyancy by brainstorming as a whole group, then breaking everyone into pairs and working individually with those teams to conduct an experiment. Using our new relationship with Oregon Sea Grant, we held multiple 30-minute sessions that taught students between third and eighth grade about Wave Energy and WECs. After a short introduction, we encouraged the students to design their own WEC and how it could generate energy. There were six sessions taught by five members of our team, and overall, we taught approximately 120 students and 24 chaperones about the fundamentals of wave energy. These students were from all over Western Oregon, ranging from Portland to Eugene. Overall, this was a highly successful event that not only educated people from many different backgrounds but also strengthened our relationships with Oregon Sea Grant to host more events like this one in the future.

Outreach Strategy Outcomes

The outcomes of this year's Community Connections were gaining better relationships with the greater Oregon community. Not only focusing on teaching others about what marine energy is and how WEC's work, but also creating bonds to increase our ability to hold more events in the future. By working with Sea Grant, we could connect with many different professionals and schools. This was an event that hosted many schools and over 50 teams of kids, from all over the Willamette Valley, so our reach was able to extend to more students from around Oregon than if we had just set up our own smaller events. Meeting these industry professionals created connections with people who plan to help us host more events in the future and improve our

educational curriculum. We also participated in a club fair at Oregon State, to increase the interest in marine energy. This helped create more buzz for the MECC program which will hopefully translate into more participants.

Social Media Strategy Outcomes

This year, for MECC's social media we focused on Instagram as this is a common platform among OSU clubs. We gained over 30 followers for a total of 62 and averaged about 20 likes per post, posting a total of 11 times and 19 times on our story. Our stories received on average about 40 views. This was a 96 percent increase in our content engagement compared to last year. We planned our posts to focus on educating our followers while keeping them updated on what the team had been up to while giving them an option for action as well. This was an effective way to stay involved with people outside of the MECC team but to continue our growth in the upcoming years, we plan to use our socials to continue connecting with other related clubs on campus such as the Marine Renewable Energy Club to create a larger presence in our community. This way we can make this competition, learning material and industry connections more accessible to students that may be interested. The team used Instagram stories for biofouling testing to document the changes in the material over the thirty-day deployment. Through this, the team was able to show the biological and oceanographic sides of WEC design and how the team's multidisciplinary approach can improve future WEC designs. During the testing of our WEC, Beaver's Digest (OSU's student run newspaper) asked to interview our team. We posted the link on our Instagram stories to share more about our team with our following as this article also touches on the impact of blue energy.

MECC also used the O.H. Hinsdale YouTube livestream to coordinate several talks with elementary school students during the team's final testing phase. The team designated one engineer to answer students' questions about wave lab operations while other members of the team went about standard testing operations. Through this, students got to see the team succeed at operating the wave lab and actively problem-solve when testing protocols went awry. This showcases the need for engineers to be flexible in the field, persevere through adversity, and that the engineering design process is never as straightforward as it seems.