

Wednesday Session Descriptions

Biegel. *A Natural Fit: Aligning the Principles of Ocean Literacy with National and State Standards*

The concern for an increase in science literacy has echoed through the halls of every educational institution, printed in a multitude of media, and demanded by politicians and policy makers alike. An individual who demonstrates science literacy is a person who recognizes that the fields of science, mathematics, and technology are interdependent endeavors that exhibit both strengths and weaknesses. A scientifically literate person is one who understands the principles of science and the significant concepts within; is acquainted with the natural world to the extent that they understand not only its diversity but interconnectedness as well; and uses the science knowledge attained and ways of thinking in his or her daily life for both personal and societal purposes (Rutherford & Ahlgren, 1991). Scientific literacy is not just the ability to recall facts. More importantly, it involves a deep collection of theoretical comprehension, capabilities to use scientific knowledge for both personal and societal reasons, and an understanding of how science is so relevant in their lives (Bevan, et al., 2010).

Coupled with America's quest to improve the scientific literacy of its citizens is the importance of developing ocean literate citizens as well. How does an individual become scientifically literate? How can the Principles of Ocean Literacy be infused into school curriculum so that future generations will be ocean literate? How do people learn about the science that influences our everyday lives in so many ways? The road to becoming a scientifically literate society in the United States is paved by two trajectories: formal and informal education. The traditional path that most individuals experience is formal education. In the educational landscape it is interesting to note that there has been a major focus with regards to what schools should or should not be doing to improve the science teaching and learning which takes places in classrooms across the country. Although the assumption by many, especially policy makers, is that the majority of science learning takes place in the formal education classroom, the actuality is that less than twenty percent of an individual's lifetime of science learning takes place within the confines of a classroom (Banks, 2007; National Research Council, 2009; Falk & Dierking, 2010). As a result, it is important that educators make full use of the twenty percent. But how?

One plausible solution is to embrace a cross-curricular approach to teaching science. Reading is an integral part of science literacy and can easily be incorporated into the science classroom. Students can learn the Principles of Ocean Literacy through a variety of inquiry activities that integrate science and English Language Arts. In my presentation I will share how I incorporate a cross-curricular approach by using the National Marine Sanctuaries as a foundation for integrating the Principles of Ocean Literacy with national and state standards. I have developed a standards and principles

crosswalk that I will share with participants. The crosswalk includes a variety of classroom teaching strategies, activities, and resources for K-5 teachers to utilize in their classrooms.

Boughton. Lake Erie Quadrangle Shipwreck Survey

This presentation begins with the discovery of a shipwreck off the shores of Presque Isle and the proceeding efforts to document and inventory the unknown history at the bottom of Lake Erie. Lake Erie has been characterized as having more shipwrecks than any other freshwater lake in the world. In the middle basin between New York, Ohio and the Canadian border there are records of 132 shipwrecks...of these shipwrecks less than 10 have been surveyed and documented. There are estimated to be as many as 250 additional wrecks that have not been discovered. The Pennsylvania Archaeology and Shipwreck Survey Team (PASST) was formed in 2014 to survey these wrecks, initiate historical research, and deploy student built technology and develop educational and outreach materials. This assembled team is now assisting the state, with limited marine operational resources, to document and inventory important submerged cultural resources within state waters. The resulting effort led to a Great Lakes Shipwreck exhibition which enlightened over 21,000 visitors in a three month period. Additionally, specialized SCUBA certifications, construction of Underwater Remotely Operated Vehicles (ROV), development of "Project STEAR" a Grade 7-12 shipwreck curriculum, preservation of artifacts through conservation science and the support and engagement of the local community have been the end result of this effort. The project is the perfect platform for STEM applications and engaging multiple stakeholders and students in a collaborative spirit of discovery and learning.

Cooper, Kurtz. *Pop-Up /Drill Down Ocean Science: An NSF-sponsored Informal Science initiative*

Much like missions to outer space, the NSF-sponsored International Ocean Discovery Program (IODP) and its flagship vessel JOIDES Resolution's (JR's) deep ocean expeditions have the potential to ignite the imaginations of a whole generation of Americans—to engage thousands of people in the excitement of exploration, the process of science, and the people and tools required to get there. The JR is on a mission of scientific discovery into the unknown. What lies beneath all that water? What secrets about our planet's development and ancient history can be revealed by sediments and rocks below? How can these explorations shed light on topics of great societal relevance, like climate change, the huge biosphere beneath the seafloor, and geo-hazards like earthquakes and tsunamis?


Unlike many of NASA's missions however, the JR's adventures and achievements have largely flown under the radar. The JR is one of the largest research vessels in the world and is the centerpiece for IODP, an international research program dedicated to advancing scientific understanding of the Earth through drilling the seafloor, coring, and

monitoring the sub-seafloor. Unbeknownst to most of the population, this country has invested more than \$700 million in scientific ocean drilling over the past 12 years alone and generated key evidence for major scientific theories, such as plate tectonics, extinction of the dinosaurs, and existence of life below the seafloor. Just in the last three years, the JR was instrumental in identifying the largest single volcano on Earth!

Since it is challenging to bring large numbers of people to the ship “in person,” to inspire them, the Pop-Up/Drill Down project was funded by NSF to bring the ship and its exciting science and discovery to the people! It will use the JR and her science to intrigue, engage, and inspire informal science audiences across the nation. Using the model of “pop-up” restaurants, shops, and museums, Pop-Up science exhibit blitzes and follow-up “drill down” deeper events at museums and libraries in carefully selected locations will provide opportunities for increasing ocean-related STEM learning access particularly among underserved minorities, rural populations and girls – and create a broadly applicable model for doing so in other science fields. The project is just getting off the ground, and it is just one part of IODP’s education and outreach offerings. Come join our session to learn how you can get involved right away, join the JR either in person or through ship-to-shore events, participate in professional development opportunities like the School of Rock, utilize IODP marine geology resources for informal settings and classrooms, and even bring Pop-Up/Drill Down to your community in the years ahead!

Day. *Sea Beyond the Classroom! High School and College Coral Reef Field Studies with MANTA and the College of Charleston*

The Marine Science and Nautical Training Academy (MANTA) is a Charleston-based 501(c)3 education and research organization focusing on the following mission: to provide high school and college students a unique opportunity to learn about the marine environment, and to participate in marine science research and conservation. The core program is an intensive, experienced-based field studies course offering instruction in fundamental and applied marine science and the principles and practices of the nautical sciences. The flagship of MANTA’s programs is a study abroad coral reef field studies course. This course is offered in partnership with the College of Charleston’s Center for International Education as a 4 credit hour summer study abroad program. Students study the biology, ecology, and conservation of coral reef ecosystems, with the emphasis on field methods, scientific diving, and hands-on experience as a crew member. The culmination of the course is a SCUBA-based student research project that is either independently designed, or part of an ongoing research project. The mobile base from which the program is operated is a large modern catamaran sailboat that serves as the dormitory, classroom, laboratory, and dive platform. This course has been offered each summer since 2009 in the Caribbean archipelago of the British Virgin Islands (BVI), where a variety of habitats ranging from coral reefs, seagrass beds, mangroves, and shipwrecks provide an ideal natural laboratory for scientific exploration. MANTA is expanding its programs to offer



additional cruises, and to move to new locales in the Caribbean, South Pacific, and Indian Oceans as MANTA's vessel circumnavigates the globe. We invite high school and college students, teachers, and researchers to partner on this decade-long expedition to explore and study our Planet's precious coral reef ecosystems.

Duncan Seraphin, Philippoff. *Beautification of the Fallen Breadfruit: Sharing stories of traditional knowledge to unite culture and scientific exploration*

Traditional knowledge helps make learning relevant by connecting community, culture, the environment, and culture. In this session, we explore stories of Hawaiian and Pacific Islander knowledge from the perspective of elders in the Voice of the Sea TV show and from the perspective of navigators on the Malama Honua worldwide voyage. We also share the University of Hawaii Ethnomathematics and STEM institute teacher professional development program and its integrating perspectives. We begin our discussion of traditional knowledge with the story of the Alingano Maisu and the beautification of the fallen breadfruit. Breadfruit is a staple crop of Pacific Islanders, who protect ownership of the trees but consider fallen breadfruit to be a less valued product, free for the taking. This story, shared through a series of images and video clips from the Voice of the Sea TV show, is a tribute to the value of perpetuating traditional knowledge and the beauty to be found in expanding your family and circle of knowledge. We continue our discussion with visuals and stories of the Malama Honua Worldwide Voyage, connecting coastal people of the world through culture, language, and traditional knowledge. The revitalization of non-instrumental celestial navigation and wayfinding, has provided confirmation of both scientific hypotheses and cultural stories about colonization of the Pacific Islands as well as anchor points for educators and students connecting traditional knowledge with scientific practice. We culminate our discussion by sharing aspects of the University of Hawaii College of Education's Ethnomathematics and STEM institute professional development program; in this program teachers examine the relationship between the environment, content, and culture and develop lessons they implement with their students highlighting these connections. We will provide resources about these programs and share lessons learned that can be utilized in the teaching and learning of aquatic science.

Fackler, Hajduk, Tumolo, and Nachbar. *Ocean Guardian Programs: Encouraging Children to Explore their Natural Surroundings to Form a Personal Connection to the Ocean*

The National Oceanic and Atmospheric Administration's (NOAA) Office of National Marine Sanctuaries (NMS) serves as the trustee for a system of fourteen marine protected areas, encompassing more than 600,000 square miles of America's ocean and Great Lakes. The NMS Education Program inspires ocean and climate literacy and stewardship of the national marine sanctuaries through engaging hands-on, STEM field programs and free online resources.

This session will introduce attendees to the National Marine Sanctuary System and the free Ocean Guardian Programs (http://sanctuaries.noaa.gov/education/ocean_guardian_prog.html) that we provide to formal and informal educators. Ocean Guardian Programs encourage children to explore their natural surroundings to form a sense of personal connection to the ocean and/or watersheds in which they live. The Ocean Guardian Kids Club offers children a stimulating opportunity to express their insights, observations and understanding of their natural environment through the creation of original stories, poetry and visual art. All K-8 students are eligible and encouraged to join. Following the completion of the required form, all members receive an Ocean Guardian Kids Club membership card, along with age appropriate goodies, such as bookmarks, tattoos, etc.

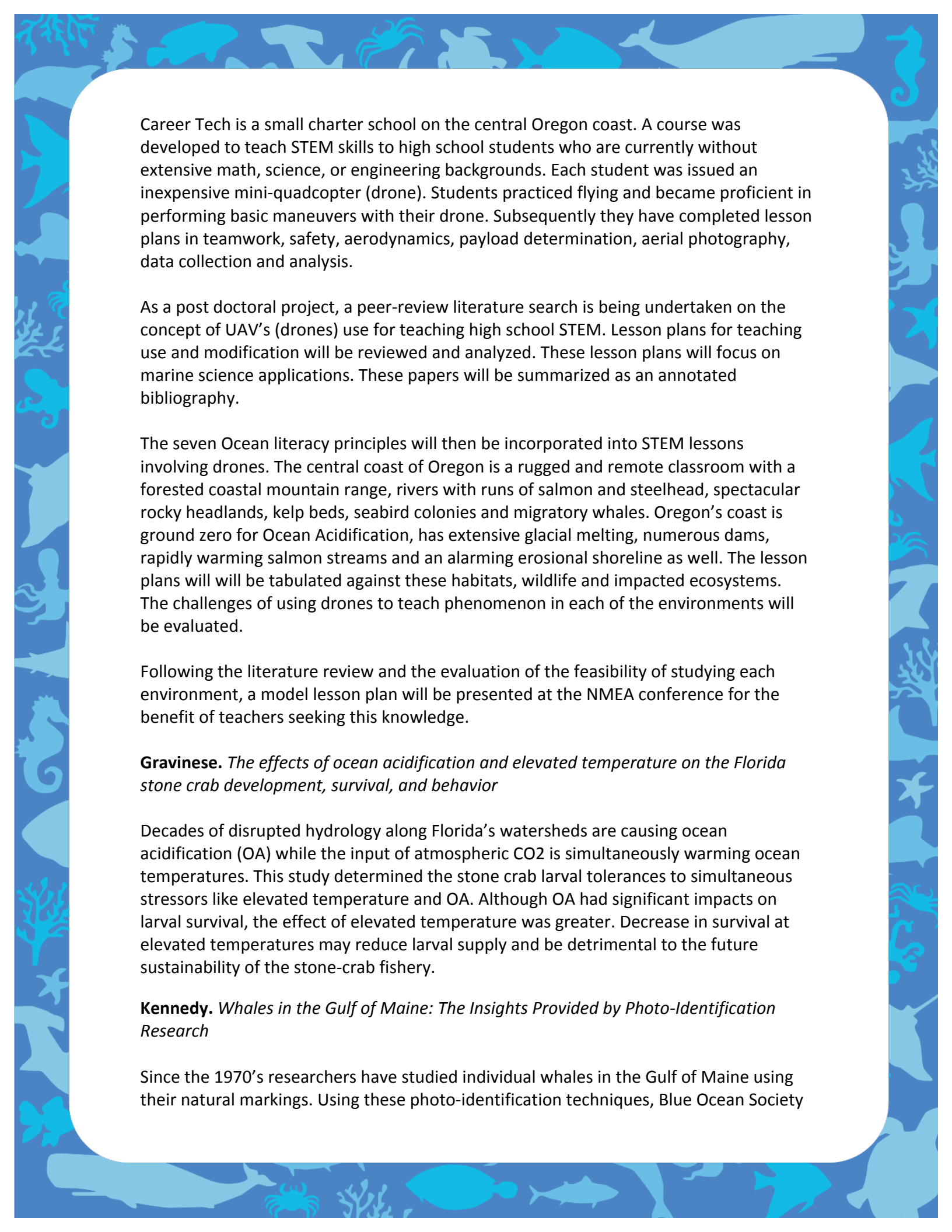
The Ocean Guardian Activity Book created by the NOAA Office of National Marine Sanctuaries and the NOAA Marine Debris Program is a free, downloadable PDF that engages grades K-3 to learn about the ocean and why it is important through word searches, games and coloring pages. Participants can also sign the Ocean Guardian Pledge to protect the ocean and all of the creatures that live in it.

The Ocean Guardian Dive Club is a youth dive education program designed to strengthen youth involvement in scuba diving and ocean conservation. This program introduces elementary and middle school students to the National Marine Sanctuary System using scuba diving to create valuable hands-on learning experiences. Dive shops around the country are currently piloting this dive club program.

Lastly, an Ocean Guardian School makes a commitment to environmental protection and conservation of its local watersheds, the world's ocean, and special ocean areas, like national marine sanctuaries. An interested school writes a proposal for what school- or community-based conservation project they plan to implement during the upcoming school year. An Ocean Guardian School provides projects for students, teachers, parents and friends to participate in a range of environmental and sustainable activities. It also provides ways for classrooms and schools to promote best environmental practices within local communities, while at the same time projecting a positive image of the school itself.

Learn about these and other free resources to bring the ocean directly into your classroom or facility that enhance student learning and increase ocean and climate literacy. Come find out more and pick up some free educational materials!

Getter, Keene. *A review of methods for teaching marine science, technology, engineering and math through the "eye of a drone" with presentation of a model lesson plan*

A decorative blue border surrounds the text, featuring various silhouettes of marine life including fish, whales, seahorses, and coral.

Career Tech is a small charter school on the central Oregon coast. A course was developed to teach STEM skills to high school students who are currently without extensive math, science, or engineering backgrounds. Each student was issued an inexpensive mini-quadcopter (drone). Students practiced flying and became proficient in performing basic maneuvers with their drone. Subsequently they have completed lesson plans in teamwork, safety, aerodynamics, payload determination, aerial photography, data collection and analysis.

As a post doctoral project, a peer-review literature search is being undertaken on the concept of UAV's (drones) use for teaching high school STEM. Lesson plans for teaching use and modification will be reviewed and analyzed. These lesson plans will focus on marine science applications. These papers will be summarized as an annotated bibliography.

The seven Ocean literacy principles will then be incorporated into STEM lessons involving drones. The central coast of Oregon is a rugged and remote classroom with a forested coastal mountain range, rivers with runs of salmon and steelhead, spectacular rocky headlands, kelp beds, seabird colonies and migratory whales. Oregon's coast is ground zero for Ocean Acidification, has extensive glacial melting, numerous dams, rapidly warming salmon streams and an alarming erosional shoreline as well. The lesson plans will be tabulated against these habitats, wildlife and impacted ecosystems. The challenges of using drones to teach phenomenon in each of the environments will be evaluated.

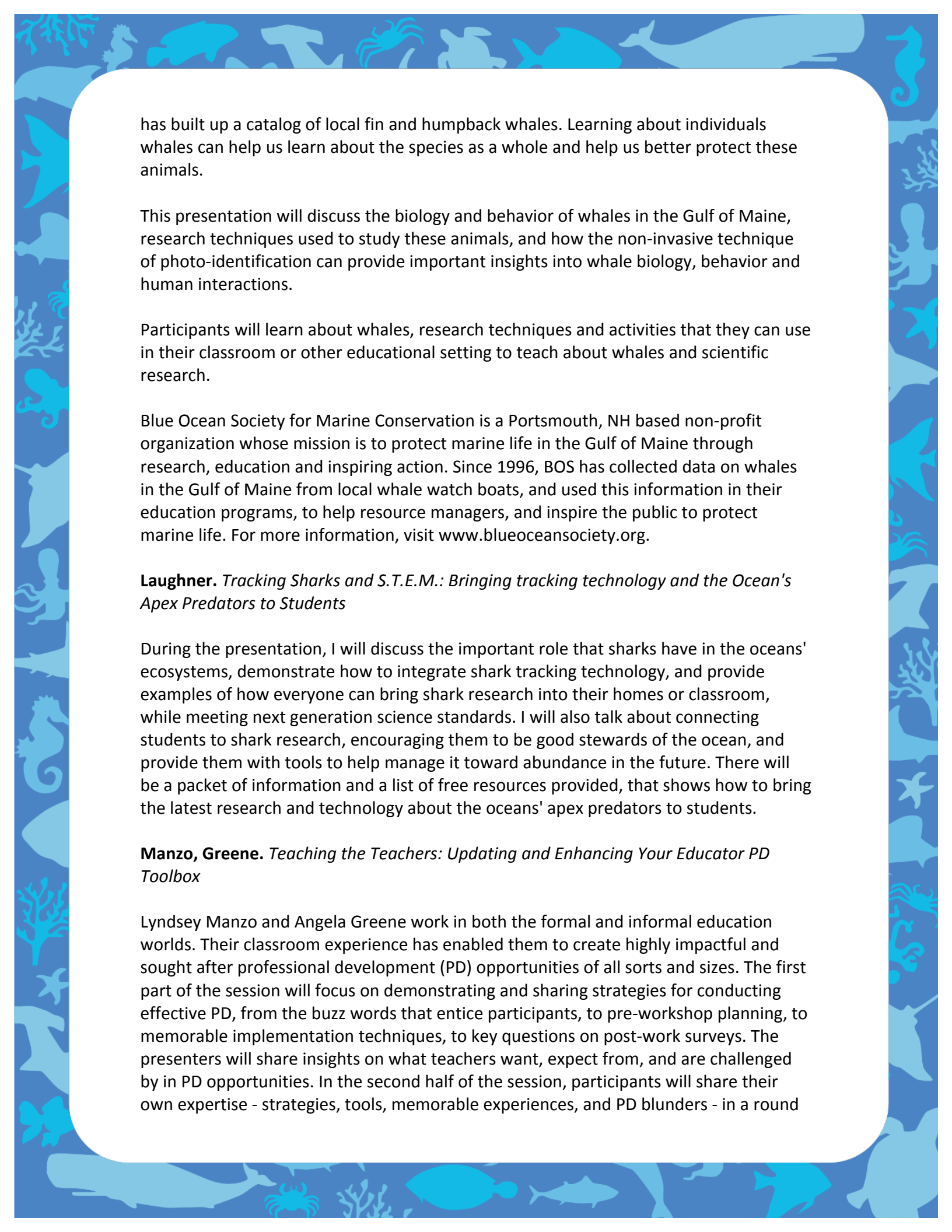
Following the literature review and the evaluation of the feasibility of studying each environment, a model lesson plan will be presented at the NMEA conference for the benefit of teachers seeking this knowledge.

Gravinese. *The effects of ocean acidification and elevated temperature on the Florida stone crab development, survival, and behavior*

Decades of disrupted hydrology along Florida's watersheds are causing ocean acidification (OA) while the input of atmospheric CO₂ is simultaneously warming ocean temperatures. This study determined the stone crab larval tolerances to simultaneous stressors like elevated temperature and OA. Although OA had significant impacts on larval survival, the effect of elevated temperature was greater. Decrease in survival at elevated temperatures may reduce larval supply and be detrimental to the future sustainability of the stone-crab fishery.

Kennedy. *Whales in the Gulf of Maine: The Insights Provided by Photo-Identification Research*

Since the 1970's researchers have studied individual whales in the Gulf of Maine using their natural markings. Using these photo-identification techniques, Blue Ocean Society



has built up a catalog of local fin and humpback whales. Learning about individuals whales can help us learn about the species as a whole and help us better protect these animals.

This presentation will discuss the biology and behavior of whales in the Gulf of Maine, research techniques used to study these animals, and how the non-invasive technique of photo-identification can provide important insights into whale biology, behavior and human interactions.

Participants will learn about whales, research techniques and activities that they can use in their classroom or other educational setting to teach about whales and scientific research.

Blue Ocean Society for Marine Conservation is a Portsmouth, NH based non-profit organization whose mission is to protect marine life in the Gulf of Maine through research, education and inspiring action. Since 1996, BOS has collected data on whales in the Gulf of Maine from local whale watch boats, and used this information in their education programs, to help resource managers, and inspire the public to protect marine life. For more information, visit www.blueoceansociety.org.

Laughner. *Tracking Sharks and S.T.E.M.: Bringing tracking technology and the Ocean's Apex Predators to Students*

During the presentation, I will discuss the important role that sharks have in the oceans' ecosystems, demonstrate how to integrate shark tracking technology, and provide examples of how everyone can bring shark research into their homes or classroom, while meeting next generation science standards. I will also talk about connecting students to shark research, encouraging them to be good stewards of the ocean, and provide them with tools to help manage it toward abundance in the future. There will be a packet of information and a list of free resources provided, that shows how to bring the latest research and technology about the oceans' apex predators to students.

Manzo, Greene. *Teaching the Teachers: Updating and Enhancing Your Educator PD Toolbox*

Lyndsey Manzo and Angela Greene work in both the formal and informal education worlds. Their classroom experience has enabled them to create highly impactful and sought after professional development (PD) opportunities of all sorts and sizes. The first part of the session will focus on demonstrating and sharing strategies for conducting effective PD, from the buzz words that entice participants, to pre-workshop planning, to memorable implementation techniques, to key questions on post-work surveys. The presenters will share insights on what teachers want, expect from, and are challenged by in PD opportunities. In the second half of the session, participants will share their own expertise - strategies, tools, memorable experiences, and PD blunders - in a round




table discussion so that everyone can add even more tools to the PD toolbox. Lyndsey and Angie practice what they preach; the entire session will be facilitated through modeling the techniques being shared. Participants will leave with a plethora of tips and tools as well as access to an additional online bank of resources.

Nuss, Sharpe. *Converting Seagrass Research into a Hands On Lesson*

Seagrass is an incredibly valuable habitat in the Chesapeake Bay, so it is important to instill respect for this habitat, as well as expose students to actual science research methods. Seagrass monitoring has been occurring along fixed transects around Goodwin Island, a protected area managed by the Chesapeake Bay National Estuarine Research Reserve in Virginia (CBNERR), for many years. This presentation is a demonstration of a lesson plan based on the seagrass monitoring occurring at this site. The lesson is centered on the interactions between water quality and seagrass percent cover.

The lesson plan was designed based on data published in a scientific paper (Moore et al., 2014) about the seagrass research. The goal of this lesson plan is to raise awareness about the values of - and threats to - seagrass ecosystems, and to expose students to a simulated ecological research method. During this presentation, teachers will be guided through a lesson plan for middle and high school students designed to build an awareness and appreciation for seagrass ecosystems. The objectives of the lesson are that students will be able to explain the basics of seagrass biology, conduct a simulated ecological research method, examine actual trends of seagrass cover from the Chesapeake Bay region, and analyze the interactions between seagrass and water quality. The hands-on portion of the lesson plan involves collecting percent cover data from mock seagrass patches along the same fixed transect at 4 different periods in time (June and August of 2010 and 2011). Water quality data will help to fill in the gaps and allow students to solve the mystery of the decline and species composition change of seagrass communities in the Chesapeake Bay.

Rogers and Petrone. *Using Models to Understand Human-induced Changes to Ocean Chemistry*

Student discussions about climate change and the ocean often include ocean acidification. This phrase and activities that involve exposing shells to different acids can lead to the misconception that the ocean is acidic. Our goal is to go back a few steps and investigate how atmospheric carbon dioxide impacts the chemistry of ocean water, not making it acidic, but less basic. Participants will use hands-on molecular manipulatives to model the common constituents of the ocean. The models will then be used to trace the formation and decomposition of carbonic acid. The series of chemical reactions that result in a lowering of ocean pH is modeled in both pre-industrial and industrial atmospheric CO₂ conditions. This modelling approach can also be used to investigate how shell formation is affected by the changing ocean chemistry. The relatively simple models can support student introductions to chemical reactions and pH as well as

higher grade learning about equilibrium reactions. But it's not just chemistry. Looking at this anthropogenic impact through a chemistry lens opens the door for the creation of middle school and high school lessons that bundle physical science, life science, and earth/space science standards focused on chemical reactions, ecosystems, and human-influenced climate change, while integrating models, systems, and cause-effect relationships. Specific NGSS elements and Ocean Literacy principles are identified. Participants will receive written activity directions and links to our favorite on-line tutorials and simulations.

Russell, Curley, Madero, Timmons, and Wharton. *Empowering Young Conservationists through a Youth Ocean Conservation Summit*

The Youth Ocean Conservation Summit, held annually at Mote Marine Laboratory in Sarasota, FL, and in cities across the country, through regional, youth-driven satellite Summits, has empowered over 1,300 young people, with the knowledge, skills, and resources necessary to successfully implement ocean conservation projects. Participants attending this conference have the opportunity to hear from scientists and conservationists about current threats to marine ecosystems, learn about the efforts of other young people in the field of ocean conservation, work with their peers and conservation program mentors to develop action plans for their own ocean conservation projects, and take part in skill-building workshops to gain the knowledge and resources necessary to make their projects successful. Throughout the year, these students remain connected through the Youth Ocean Conservation Team, a virtual, global network of Summit alumni, as well as other youth and adults who are passionate about protecting our planet's marine ecosystems.

Through this engaging workshop session, participants will learn about the mission, components, and impact of the Youth Ocean Conservation Summit program. Representatives from five institutions will share how their organizations, working with teams of student leaders, have implemented the Youth Ocean Conservation Summit model through satellite summit events in cities across the United States – equipping young people in diverse communities with the resources and support needed to take on marine conservation challenges. Through this session, these individuals will share key lessons learned from hosting a Youth Ocean Conservation Summit, as well as the impact of this program on their event planning team, youth participants, and local marine environments. Student driven ocean conservation projects that have emerged from this program will also be highlighted as well as ways students can connect to the educational opportunities and resources of the Youth Ocean Conservation Team network – including a monthly e-newsletter highlighting student conservation initiatives and opportunities to connect with a global audience.

Participants will learn key lessons for empowering young people with the skills necessary to lead their own ocean conservation projects, and will learn about the opportunity for their institutions to partner with a group of youth leaders to bring a

satellite Youth Ocean Conservation Summit to their region. To date, these events have been held in Baltimore and Annapolis, MD; Seattle, WA; Savannah, GA; Newport, RI; Long Island, NY; Pine Knoll Shores, NC; New York City; Corpus Christi, TX; and St. Louis, MO.

Workshop attendees will receive handouts regarding the opportunity to participate in the 2017 Youth Ocean Conservation Summit and associated Youth Ocean Conservation Film Competition. Additional materials regarding the opportunity to host a satellite Youth Ocean Conservation Summit and opportunities to engage students in the Youth Ocean Conservation Team network will be provided. Individual presenters will also share resources regarding their specific Youth Ocean Conservation Summit events.

Russell. *Cultivating a Community of Changemakers with SeaWorld's myActions*

As educators, we teach students that each action they take to protect the environment makes a difference, but often it is challenging to highlight the collective impact of every day environmental actions. The SeaWorld myActions platform is an innovative social networking style site and app offering students and classrooms the opportunity to share their daily actions to protect the ocean and environment, while inspiring and challenging other young people to do the same. Through this platform, students are able to share their daily conservation actions. From simple steps like recycling and saving energy, to leadership roles organizing community cleanups and educational events, myActions helps students track how their impact adds up over time and allows them to interact with young conservation leaders across the country. The myActions platform equips students with tools to challenge their classmates, friends, and family to take action to protect the ocean, and also provides them with opportunities to connect with and learn about wildlife conservation efforts supported by the SeaWorld & Busch Gardens Conservation Fund. Through the platform, students are able to select their favorite wildlife or habitat conservation cause, and earn monetary contributions to support this cause based on the environmental actions they share. Additionally, students are able to receive recognition for their efforts through virtual badges and track their personal environmental impact, measuring their approximate carbon dioxide reductions, environmental action totals, and personal monetary savings based on the actions shared through the platform.

Through this interactive workshop, you will have the opportunity to explore the SeaWorld myActions site, learning about the opportunities it offers your students to highlight their conservation efforts. You will be introduced to students from across the country who are taking action to protect the ocean in their communities, and highlighting this work through the SeaWorld myActions platform. Additionally, you will have the opportunity to try out the SeaWorld myActions platform on your personal device, and learn the steps to set up a group for your school, class, or institution in order to directly engage your audiences in the platform, design challenges among students and classes, and measure the collective impact of their environmental actions. You will

also learn how to utilize the SeaWorld myActions platform as an evaluative tool for conservation education programs. Finally, you will learn about the SeaWorld & Busch Gardens Conservation Fund, and ways your students can learn about global conservation efforts through the SeaWorld myActions platform.

As a workshop attendee, you will receive handouts on the SeaWorld myActions platform, training for implementing this program in your schools/institutions, and have an opportunity to utilize your phones/devices to engage in a live conservation action challenge through the SeaWorld myActions platform.

Sautter. Exploring the Seafloor: Using Multibeam Sonar to Map and Characterize Seafloor Habitats

The College of Charleston BEAMS Program, established in 2007, is an undergraduate-focused training and research program with the mission to develop scientific ocean surveyors in support of the academic, research and operational marine communities. The BEAMS Program offers at-sea data acquisition experiences and requires a full research project which students present at regional and national meetings. BEAMS Program students conduct research using advanced software to generate bathymetric and acoustic backscatter maps of the seafloor. These maps aid in identifying potential fish and coral habitat, and have also led to numerous discoveries related to seafloor features. To date, over 140 students have participated in BEAMS, and more than half have chosen to continue in the marine geospatial field, either by successfully pursuing graduate school or by finding employment in private industry, as well as with NOAA and other agencies. The combination of learning new technologies, conducting and presenting research, and gaining hands-on field experience has proven to be a strong attractor for students, particularly as they are extremely marketable in the growing marine survey workforce. <http://oceanica.cofc.edu/beamsprogram/>

Strang, Fauville, Cannady. The International Ocean Literacy Survey

In 2015, many members of the international ocean literacy community discussed the urgent need to measure progress in the development of Ocean Literacy in our respective countries, regions and even programs. We agreed to work together as a community to develop a common, widely accepted instrument to measure Ocean Literacy. The Lawrence Hall of Science at the University of California, Berkeley and the University of Gothenburg took the lead on coordinating this unfunded, grassroots project. Marine educators, researchers and evaluators from Europe and the US generously shared their intellectual property for this community effort by contributing whole surveys and survey items from previous efforts. We edited and assembled the items into a comprehensive survey of Ocean Literacy, which was administered to 415 students in June 2016 in our first field test.

Based on the results from this first run, we updated the survey by editing, deleting and

adding some items. While preparing the second run, we also strengthened the International Ocean Literacy Survey network of support with partners and collaborators around the world. The National Marine Educators Association (NMEA) and Asia Marine Educators Association (AMEA), and Canadian Network of Ocean Educators (CaNOE), the Marine Conservation Society and the European Commission are now officially supporting and involved in the development of the project. Individuals and institutions around the world volunteered to contribute additional items and, most importantly, to translate the survey into 16 languages. The second version of the survey, which includes items measuring ocean knowledge and marine environmental attitudes was launched in September 2016 and was widely distributed in more than 25 countries. We gathered over 4,000 responses and will present in this session the findings from this second field test of the Survey instrument.

By summer of 2017, we will have created a review and advisory board, comprised of ocean scientists, ocean science educators and education researchers, in order to ensure the highest quality of the survey questions. A third version of the survey will be tested around March 2017 in even more languages. The results obtained so far will be presented during our presentation.

This session will present the history of the development of the survey, our findings to date, and will provide an opportunity to discuss the future utility of the International Ocean Literacy Survey as an integral tool for promoting and improving our efforts around the world to increase Ocean Literacy.

Sutton. *Using Mobile Apps to Track Marine Critters*

“Using Mobile Apps to Track Marine Critters” will include 2 separate activities designed for classroom use and for citizen science implications. Part I – “Citizen Science Using JellyWatch” will guide participants through the use of the JellyWatch application; assisting them in application download, data entry and database access to explore various species of jellies being monitored on a global scale. Participants will be encouraged to participate in the JellyWatch global monitoring program by adding observations to the database via the mobile application. This activity is applicable to elementary, middle, and high school students as well as adults. Participants are also encouraged to share their knowledge of JellyWatch with students and the general public to promote the citizen science approach intended by the JellyWatch creator (Steve Haddock, Ph.D – Monterey Bay Aquarium Research Institute).

Part II – “Tag! You’re It!” is a classroom activity designed for middle and high school students. Participants will learn to navigate the OCEARCH website to locate tagged sharks, biological information, and shark images. Participants will also learn to navigate and locate the metadata needed to plot GPS coordinates using Google Earth software. (A modification using paper maps will also be demonstrated.) This activity will simulate the classroom activity as participants are guided through the scientific process to

explore variables that may impact shark movement throughout a 1-year cycle. Lab report templates, maps, and sample data sets will be provided during this demonstration. A spin-off of this activity that features the TOPP (Tagging of Pelagic Predators) application for tracking species in the Pacific Ocean will also be reviewed.

Toro. *Building Ocean Drifters: From Prototype to Full Scale*

This session will provide an overview of an Ocean Drifter Unit and lessons that incorporate several science concepts including buoyancy, density, ocean currents, waves, and climate change. The unit is highly inquiry based through the use of hands on investigations which include several labs using a wave tank. After learning relevant science principles through hands on learning, students begin constructing their prototype of an ocean drifter. Engineering design process will be integrated heavily into the unit as students repeatedly test their model in the wave tank and expose their prototype drifter to currents and waves. If funding is available students then build full sized ocean drifters, that can be deployed to sea. Once drifters are deployed, students can observe their path and make predictions for their future trajectory based on previous current maps, weather data, and other variables.

Attendees of this session will be provided a copy of the full curriculum plan for this unit. Within the 45-minute session, attendees will be shown a few of the background lab activities in a powerpoint overview with personal pictures from classroom instruction. In more detail the actual engineering design process for building the prototypes is explained. Using an 8-foot wave tank educators will experiment with several prototypes brought from previous students' designs for ocean drifters. The plans for building your own wave tank are included in the presentation materials. Tips will be provided on how to fund a project, find cost effective materials, tips for what works and what doesn't, as well as who to contact to deploy a drifter. The presentation will conclude with example data from a previously deployed drifter and examples of how the data can be integrated into classroom discussion about various topics including climate change, ocean currents, and significance of currents on organisms and weather.

Ulderich, Bishop. *The Garbage Patch Kids*

During this conference session, educators will participate in a webquest focusing on the garbage patches in the Pacific and Atlantic Oceans. We will engage in hands on activities focusing on protecting the oceans and sea life. Examples of children's books my students have written and published will be on display. Instruction will be given how to engage students in writing a children's books that can be donated to the school library in order to pass on their knowledge and passion for protecting the world's ocean. Educators will also participate in writing activities using "Wisdom, The Midway Albatross" by Darcy Pattison and Kitty Harvill. Lesson plans and hand-outs for all of the activities will be provided to the the session participants.