

# UC San Diego

## Capstone Projects

### Title

Bringing Oceans into the Classroom with Mr. O.:A Marine Science Supplement for High Schools

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**Bringing Oceans into the Classroom with Mr. O.:**  
A Marine Science Supplement for High Schools

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## Abstract

*Oceans with Mr. O.* is a supplemental materials and resources tool for high school marine science education. It is specifically designed to provide an experiential learning opportunity for students who are not able to, or have never visited the ocean. Experiential learning establishes a sense of connection and responsibility for the oceans;<sup>1</sup> however, many high school students, even in a coastal city like San Diego, CA, do not have equal access to experience the ocean first-hand. One solution is to bring the ocean to the classroom through educational materials and visuals. The video modules created through this project will provide an immersive experience with the ocean through the film lens, as well as embedded questions to facilitate important conservation discussions around key concepts. The Next Generation Science Standards (NGSS) have revolutionized the way in which teachers prepare students in the discipline of science. Teachers are tasked with finding “anchoring phenomena” from which to teach scientific concepts.<sup>2</sup> Introducing students to local natural phenomena drives student curiosity and learning. The films will act as a springboard that teachers can build off of when building inquiry-based science curricula that aligns with the NGSS or their classroom. The short videos are each accompanied by resource guides that include discussion questions and answers, relevant vocabulary, examples of hands-on activities, further research information, and helpful images.

## Background Information

Beaches and coastlines have become synonymous with images of vacations and travel. That is no coincidence, considering that according to NOAA, only 40% of the United States population lives within counties along the coast.<sup>3</sup> Traveling to the coast can be cost-prohibitive and logistically difficult, reducing accessibility and connections to the ocean.

Family travel is only one path to expose the next generation to the beach; school field trips are another possible pathway. However, school field trips can be expensive, especially for inland schools. For example, San Diego Unified School District (SDUSD) estimates field trips as \$230.00 per bus round trip during business hours, and a bus can only carry 48 students.<sup>4</sup> There are usually five periods of one subject, and class sizes are often around 36 students. Thus, a field trip during school for all the freshman students taking biology would cost almost \$1000. In 2021, the budget for school activities is projected to be much less than years prior. SDUSD will have a shortfall of \$155 million for their entire budget.<sup>5</sup> The COVID-19 pandemic has drastically changed the landscape of education, especially with the decrease of school field trips and hands-on opportunities. There is a greater need for virtual learning resources and fewer opportunities for in person instruction and connections. The Biden Administration plans to help historically underserved schools, especially with experiential learning and field trips, however the money will be short-lived and teachers will still be tasked for find alternative and adaptive teaching methods.<sup>6</sup>

The struggle to connect students to the ocean is more challenging than just funding field trips. There is a need by teachers, especially high school teachers, to have more ocean science in the classroom. According to teachers surveyed for this project, they would like to see more tools and devices bridging ocean related phenomena to

students who would otherwise not be exposed. As teaching methods continue to adopt NGSS alignment, there will be an increase in usage of virtual video resources.

In 2013, California adopted the [Next Generation Science Standards \(NGSS\)](#). NGSS is designed to focus on bridging real world examples to fundamental science building blocks through critical thinking and problem solving.<sup>7</sup> NGSS has widely been adopted by Kindergarten through 8th grade (K-8), but high schools are still able to instruct based on the teacher's discretion. Inconsistencies among teachers' discretions lead to varied student outcomes and test scores. As Crystal Howe - Environmental Literacy Coordinator of the San Diego County Office of Education - put it "high school curriculum is still 'the wild west' where teachers can do whatever they want still."<sup>8</sup> By 2023, all schools in California, including high schools, will be required to have adopted NGSS. Howe continued saying "[High School] teachers need to be eased into teaching NGSS" and videos and supplemental materials will aid their transition process.

The video modules are targeted to 9th and 10th grade students, the years in high school when teenagers typically enroll in biology, natural sciences, environmental science, marine science, and life sciences. With the increase of remote learning, many forms of education have had to adapt to a virtual setting. Therefore, *Oceans with Mr. O.* is an appropriate tool for educators transitioning to remote learning, to the NGSS curriculum, and to students with minimal exposure to the wonders of the sea.

## Methods

### *Survey*

After completing the necessary trainings and Internal Review Board (IRB) exemption process through UC San Diego, a survey was designed to determine the specific needs and interests of educators that would utilize the resources created. The survey consisted of a mixture of multiple choice questions and open short answer questions. Here is a list of questions asked:

- What grade level do you teach?
- Which of the following class(es) do you teach?
- Is your school public, private, charter, or other?
- Does your education system require a specific curriculum framework?
- How often do you utilize videos in your lessons?
- How far is your classroom from a coastal access point?
- Select all ocean science video topics you would be interested in incorporating into your curriculum.
- Would you and your class lesson benefit from followup discussion questions, resources, and suggested activities?
- Would you be willing to pilot a video lesson in one of your lessons?
- Would you be available for potential follow up questions and providing suggestions?
- Do you have any open ended suggestions for specific content, style, formatting, topics, etc. for the production of these videos?

### *Findings*

The survey was distributed to personal networks and connections of marine science educators and asked to be shared among colleagues. After 58 responses, it was determined that there is a need for *Oceans with Mr. O.* resource modules. Notable

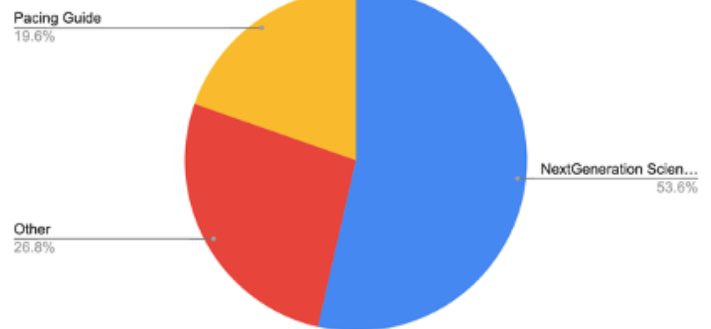
findings include 85% respondents utilize videos in their lessons weekly (Figure 1). Only 54% of schools represented in the survey require the NGSS curriculum framework currently (Figure 2). Lastly 66% classrooms represented are over 30 minutes driving distance from a coastal access point (Figure 3), and that is heavily biased towards the networks surveyed being mostly from Southern California.

Figure 1

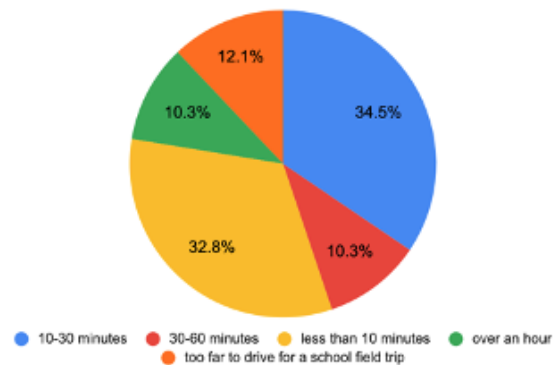


Figure 2

Curriculum framework currently required by participants' schools.



How far from your classroom from a coastal access point in driving time?



Some noteworthy quotes from the open ended suggestions include:

- “We focus on things like quadrats, transects, core samples, mark and recapture, ROVs, etc. I would love a video that shows these things in action and describes why they are useful...even limitations of the tools.”
- “Extensive science content, vocabulary definitions, linkage to what youth can do to change the environmental crises we face.”
- “It would be helpful to have stopping points in some of the videos to boost background knowledge to make the video more meaningful.”
- “I prefer videos that have questions that students answer in order as they watch. It would be nice to have additional resources as well “
- “it would be nice to have more POC narrators and scientists. I know that seems random but it helps when my kids can 'see themselves' as marine scientists”
- “Quality of videography matters to my students and they are immediately disinterested if a video is not HD or professionally designed. Also, incorporating storyline and humor adds so much!”
- “NGSS related phenomena is one area of interest”

## *Film*

Two local topics were chosen to be the first of the video modules created: *Tidepool Adaptations* and *Watersheds*. Both subjects could be filmed locally in San Diego County, and connections could be drawn to other related scientific concepts. The videos were edited to remain under 15 minutes. They are intended to showcase beautiful scenery and introduce applied scientific concepts. Professionals in the field of these topics were interviewed to provide background information and expertise to enhance the credibility of subject matter.

*Tidepool Adaptations* was filmed predominantly at Cabrillo National Monument with some additional footage from tidepools and shoreline in La Jolla. This video module embeds key academic language and offers opportunities for pause points with key questions to prompt critical thinking and facilitate classroom discussion. It also applies concepts of adaptation and biodiversity to a specific community of organisms. Andrew Rosales, of Cabrillo National Monument was interviewed to discuss the importance of, and intrinsic value of tidepools. Later, Danielle Mchaskell, a PhD student of Scripps Institution of Oceanography, was interviewed about current scientific studies of organisms in tidepools and representation of minorities in the scientific community.

The *Watersheds* module focuses on the importance of ecosystem functions as a whole. Similarly, individuals who know the habitat were interviewed. Shankar Shivappa and Steffani Jijon, representing the San Diego River Park Foundation explain the significance of a watershed and the headwaters. Fay Crevoshay of WILDCOAST discusses the challenges with management of a watershed using the binational Tijuana River as her example. More scientific terminology is introduced and visuals of various parts of a watershed are displayed.

## *Supplemental Resources*

Each video module is accompanied by a supplemental materials document. The partnering documents outline NGSS concepts that can be linked to ideas introduced in the videos. The resource guides also contain relevant vocabulary (including definitions for words highlighted in the videos), links to further resources, potential classroom activity ideas, and helpful images.

## *Product and Distribution*

Another deliverable of this project is a distribution plan for how educators will get ahold of the resources. A [website](#) was created to host the resources and the videos. This link will help teachers find all the resources in one place. Videos are embedded (but also linked to YouTube), have resources online, and are downloadable for use offline. Personal branding on social media platforms will also facilitate the usage and distribution of the videos. The social media handles can be found below:

Instagram (@Oceanswithmr.O);



YouTube channel (*OceansWithMr.O.*);

Vimeo (*OceanswithmrO*);

Facebook Pages(*@OceansWithMrO*);

Twitter (*@OceansWithMrO*);

Tiktok (*@oceanswithmr.o*).

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