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Kids on the Beach Pilot Project Report

Prepared for the Skagit County Marine Resources Committee

September 10, 2018

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One Ocean Environmental

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Introduction

Kids on the Beach (KOTB) is a pilot science program initiated by Pete Haase of the Skagit County Marine Resources Committee and designed by One Ocean Environmental to increase ocean literacy in eighth grade students in Skagit County schools. Haase approached One Ocean Environmental (One Ocean) with this idea and together we designed a plan for 8th graders in central Skagit County to get to the beach. This is a student population that does not have regular access to marine habitats nor marine ecological education. The student mission was to conduct an authentic scientific inquiry, generate data for use by the Washington Department of Fish and Wildlife (WDFW), and interpret research findings for the public. This mission was accomplished through Next Generation Science Standards-based classroom lessons, field work, data analysis, and a public presentation of research findings modeled after a scientific conference. Haase secured funding for the project from Skagit County Public Works through a grant from the US Environmental Protection Agency through the Puget Sound Partnership and the Northwest Straits Commission. Conway Middle School eagerly signed on for the experience. We worked with Conway's 8th grade Science Specialist, Ron Haywood and a total of 50 students, who reached for and met the goals set for them in this multifaceted research, writing, and communication project.

Project Goals

We set program goals to accomplish the following:

1) Increase ocean IQ in Skagit Co. 8th grade students through forage fish research
2) Offer a hands-on scientific research project to support student prep for first statewide testing on the Next Generation Science Standards (NGSS)
3) Increase student buy-in by supporting them in generating quality data useful to WDFW
4) Impart the importance of science communication through a student science symposium

Whether students reached these goals was measured by the following success criteria:

1) Pre- and post-project Salish Sea food web quiz score
2) Washington Comprehensive Assessment of Science student scores from 2018 (available August, 2018)
3) Student surf smelt data incorporated into WDFW surf smelt monitoring data
4) Research presentation through slide show or poster at a student science symposium at Fidalgo Bay Resort

Next Generation Science Standards

The NGSS are grade-specific science and engineering practices and cross-cutting concepts in physical, life, and earth and space science disciplines, designed to support teaching science through doing science. The KOTB pilot project specifically addressed stability and change in an ecosystem within the Middle School Life Science (MS-LS) discipline. Specific standards used in this project are presented here.

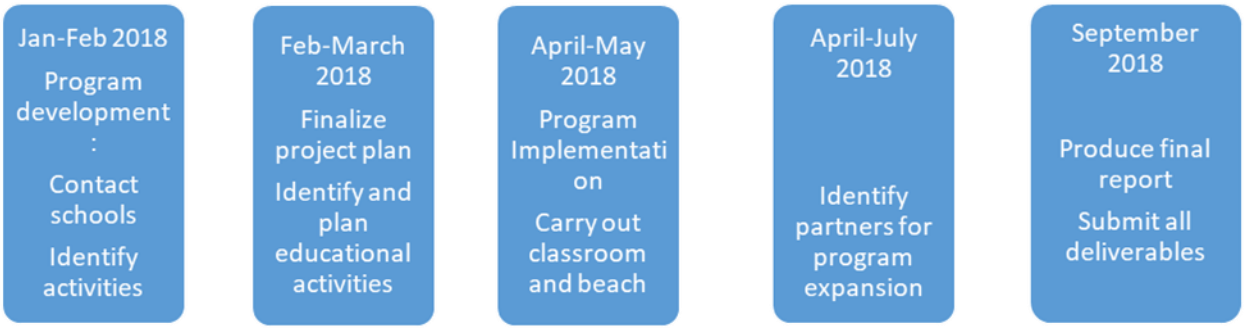
MS-LS2-4 Construct an argument supported by empirical evidence that changes to physical or biological components of how an ecosystem affects populations.

MS-LS4D Biodiversity and Humans: What is biodiversity, how do humans affect it, and how does it affect humans?

Each of the following NGSS Practices were addressed in the course of this project:

- Asking questions and defining problems
- Planning and carrying out investigations
- Analyzing and interpreting data
- Using mathematics and computational thinking
- Constructing explanations and designing solutions
- Engaging in argument from evidence
- Obtaining, evaluating, and communicating information

Project Timeline



Project Summary

One Ocean Environmental introduced a problem to the 8th grade students in two classes at Conway Middle School. Beach restoration projects have been occurring in Fidalgo Bay to improve habitat for fish species there. The problem was that no one knew whether the restoration efforts were decreasing surf smelt egg mortality or increasing species richness. We announced a Request for Proposals after introducing the interplay of shoreline development and nearshore fish biodiversity and spawning habitat. $2,000 was offered to the best proposal to assess the effects of beach restoration on each issue. Proposals were due via Google Docs by 3pm two days later. One well-supported and thought-out proposal was chosen from each class.

We then guided students through proper research design and field journal preparation for data collection at the Fidalgo Bay Resort on Samish Nation land. They chose to use WDFW beach seining protocol and surf smelt survey protocol to collect their data, which required a small army of eager volunteers on both accounts. On field day all were welcomed by Samish Nation elder,

Rosie Cayou James, with words from her heart, a prayer song, and an unexpected traditional blanketing of two of us.

Volunteers from NW Straits Foundation, Samish Dept. of Natural Resources, Fidalgo Bay Aquatic Reserve Citizen Stewardship Committee, Washington Conservation Corp, Trail Tales, and SCMRC all joined the efforts to train students and assist them in seining for nearshore fish or collecting sand and gravel samples to count surf smelt eggs. The event was reported by the Skagit Valley Herald and the NW Straits Commission Newsletter. Data will be added to the forage fish spawning and the nearshore fish diversity monitoring efforts by the WA Department of Fish and Wildlife.

Winnowing surf smelt eggs

Separating eggs from sand and microscopy for egg mortality

Beach seining for nearshore fish diversity
All photos by Pete Haase and Ann Penry

Following data collection and historical data mining of WDFW surf smelt egg mortality records for this site, One Ocean returned to the classroom to guide data analysis. Students were introduced to linear regression analysis to determine if there was a significant relationship between years since restoration and a) fish diversity or b) surf smelt egg mortality.

Students created figures and calculated correlation coefficients and p-values, learning both scientific and translational language around these concepts to communicate their data to a broad audience. These were imbedded artfully into slideshows along with research summaries and several of the photos included in this report. Nervous but prepared students presented their research in a forum modeled after a scientific conference, again on the Samish Nation site where the research was conducted. I could not have felt more inspired nor impressed by the depth of understanding communicated by these students to a sophisticated and mixed audience. The conference was attended by many of the project volunteers, members of the local marine science community, a Skagit Valley Herald reporter, and the outgoing and incoming Superintendents of Public Schools for Conway.

One Ocean made a final visit to the classroom to congratulate students, administer a post-assessment, collect a sample of student journals, and ask for student and teacher feedback.

Pre- and post-assessment results

Students were asked to complete a brief quiz on food webs, species diversity, and basic ecological vocabulary before and after the project. The research improved student understanding (Table 1).

Table 1: Average assessment scores before and after the research project for each class. Total possible points = 6.

Class	Pre-assmt average	Post assmt average
Fish diversity study	2	4
Surf smelt egg mortality	3	4

Student feedback

From student feedback and qualitative observations, it was apparent that students cared about what they were doing because they generated real data about real restoration effort efficacy. One may count on 8th grade students to be completely forthcoming (blunt) in their opinions of an educational experience, as exemplified by a few selected responses to the follow-up survey:

"Before this research I thought science was boring. Now it is kinda cool." -Chance

"I do feel that I am more prepared for high school and testing because I got a chance to collect real data that might have an impact. I think that it was a great way to learn how to do an experiment." – Kaylee

"Before this research project, I was very interested in science because everything has science to it, but after this research I found out that my class and I were capable of finding the science in something like real scientists doing advanced research." -Ava

"Yes, I do feel better [prepared] for science testing and high school classes because I learned a lot of research and graphing skills from this project and I learned how to handle a real-world science situation." -Ava

I do think that this is important and I do recommend it. For one it is a great way [to learn] how to do a real experiment that will have an impact. Also, it wasn't just data that other people helped us with. We did everything from the procedure, hypothesis, presentation, data collection, and the conclusion. I think that if you are having a hard time understanding those things this project will help because you do everything with the help of people who know what they are doing. -Kaylee

"I did not understand science as much and [it] was boring, but then I got interested in it after this." -Abisaid

"I feel better prepared in learning how to gather data and how to word a hypothesis and a conclusion. I feel better prepared for high school science thanks to this project. I will definitely use the skills I learned in high school." -Casey

"Yes, I would recommend this to a 7th grader because he or she would learn how to do statistical analysis and how to find eggs the correct way." -Piyanshu

“I do have more respect for science after this.” -Aiden

“Yes [I’d recommend it to 7th graders] because you actually have to hands-on work with a group and learn a lot more when going out to do so, and learn a lot with Mira about fish.” -Sheridan

“I feel that the skills learned during this lesson will most definitely come in handy during high school science.” -Bates

Teacher feedback

"The KOTB program provided an amazing opportunity for our students to become citizen scientists and gather data that will help Scientists make important decisions about our environment. Their public presentation to an audience of scientists and volunteers of their findings on foraging fish and herring spawning in Fidalgo Bay provided a setting that motivated my students to produce high quality work that exceeded my high expectations. In total, KOTB was the greatest student project that I have ever experienced with my middle school students. I look forward for the opportunity in the near future."

-Ron Haywood, Conway Science Teacher

Media coverage

Two Skagit Valley Herald articles shared the flavor of the beach research project with the public. The first, “Pilot program gets kids doing science,” described the day of data collection in Fidalgo Bay. The second reported on the public presentation that students gave of their research findings. The Skagit Valley Herald photos and links to articles are found below.

Samish Cultural Outreach Manager Rosie Cayou speaks to Conway School eighth-graders Wednesday about the importance of the beach environment they were about to study.

Scott Terrell / Skagit Valley Herald

Conway School eighth-graders Catie Couch (left) and Katelynn Hubbard react Wednesday at the prospect of handling a fish. The two gathered their courage and measured the fish during a youth program sponsored by the Skagit County Marine Resources Committee at the Fidalgo Bay RV Resort.

Scott Terrell / Skagit Valley Herald

https://www.goskagit.com/news/environment/pilot-program-gets-students-doing-science/article_e3181807-e77f-53bc-8bdc-64ba2161b5e1.html

Conway School eighth-graders look Friday at surf smelt eggs that are stuck to pebbles from the Fidalgo Bay beach.

Kimberly Cauvel / Skagit Valley Herald

https://www.goskagit.com/news/conway-students-share-research-findings/article_a2061b47-6b83-526f-b8fb-3cf774c716ae.html

Partners for program expansion

Since the inception of the project and its positive press, we have heard from two Anacortes Middle School Science Teachers, one from Edison Elementary who may want to combine the science with an art project, and the Science Teacher at Mt. Baker Middle School may like to participate next year. I have begun working with the SeaDoc Society as their new Education Coordinator, giving the Kids on the Beach program an additional collaborator with a wide reach throughout our region. We look forward to building the KOTB program throughout the area overseen by the NW Straits Commission, eventually gaining additional scientist-educators in multiple counties to fill the role which One Ocean Environmental played in bringing Pete Haase's idea into fruition in Skagit County last spring.

Acknowledgements

This program would not have been possible without the generous support of the Samish Indian Nation, who graciously shared a formal greeting of the students by Rosie Cayou James, their land on Fidalgo Bay, their conference center on the site for our presentation, and a Samish Department of Natural Resources staff member, Matt Castle, to help guide the beach seining work. The NW Straits Foundation also provided staff support for seining through Jason Morgan. Thanks goes to the Skagit County MRC, especially Tracy Alker, for project oversite and funds allocation, to the NW Straits Commission and Foundation, the Puget Sound Partnership, and the US Environmental Protection Agency for granting funds to hire One Ocean Environmental and provide busing for Conway students. Finally, thanks belong to the multiple volunteers from the NW Straits Foundation, the Skagit MRC, the Fidalgo Bay Aquatic Reserve Citizen Stewardship Committee, Trail Tales, and Friends of Skagit Beaches. This was a shining example of what environmental scientists and citizen and student scientists can do together to heal the Salish Sea.