Explorations & Possibilities for

Environmental Engagement

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Image Source: Exploring the Blue Marble

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Purpose

Decades of research in environmental education suggest that children can be effective environmental leaders when they are seen as valuable contributors and supported in taking local actions [1]. A number of significant international agreements have been developed to create a framework for how to engage young people in environmental education:

- UNESCO's Tbilisi Declaration (1977) defined the ultimate goal of environmental education as enabling students to work toward the solution of environmental problems [2].
- Agenda 21 gave children and youth the status of a major group who need to be involved in participatory processes for a sustainable environment [3].
- The United Nations Convention on the Rights of the Child (which defines children between the ages of 0-18), provides that children have a right to have a voice in decisions that impact their lives, including those decisions that impact their environment [4].

These broad frameworks emphasize informed action – in which children are not *recipients of* knowledge, but *actors* in generating knowledge and taking action [1]. It is within this framework that I initiated an exploration of opportunities and possibilities for environmental education in Monterey Bay in general, and at the Big Sur Charter School in particular. These frameworks are particularly promising for Big Sur Charter School because of the school's emphasis on academically challenging programs that meet the individual learning needs of its students.

Children's Participation in Environmental Education and Stewardship

Models for children's participation in environmental education emerged from international frameworks described above, in part because formal environmental education – which is often focused on dissemination of information rather than ownership of knowledge and taking action – does not often contribute to changes in young people's behaviors [1]. But these models also emerged because young people repeatedly state that they would like opportunities to make a difference in their communities, particularly for environmental care [5] and many children's advocates believe they have a right to do so [6]. Riemer and colleagues [7] also have found that while many young people do engage in environmental change advocacy, they typically do so *outside* the formal education sector. They suggest that environment programs that focus on youth engagement may be more effective in long term interest and action. They identify key components of environmental engagement approaches as:

- Fostering active citizenship;
- Instilling a sense of social responsibility;
- Providing opportunities for capacity building and leadership;
- Encouraging youth to develop self-awareness [7].

Growing Up Boulder is a model for such youth engagement, that has involved children and youth (ages 4-18) in design, planning, and environmental stewardship within the city of Boulder, Colorado since 2009 [8, 9]. This initiative uses an approach to engagement that includes the heart (as initiative), head (as knowledge generation and integration), and hands (as action, stewardship, and policy) (Figure 1). Common to models for young people's participation in environmental education [5,6,7,8,9,10] is that young people's engagement can operate at multiple scales, having influence on young people's own sense of self and self-efficacy, as well as their local environment, community, or policies. These models further emphasizes that methods be multi-model and creative (Figure 1) – from field trips, to interviews with community members, to the arts as a means of expressing ideas and concerns [5,6,8,9,10].

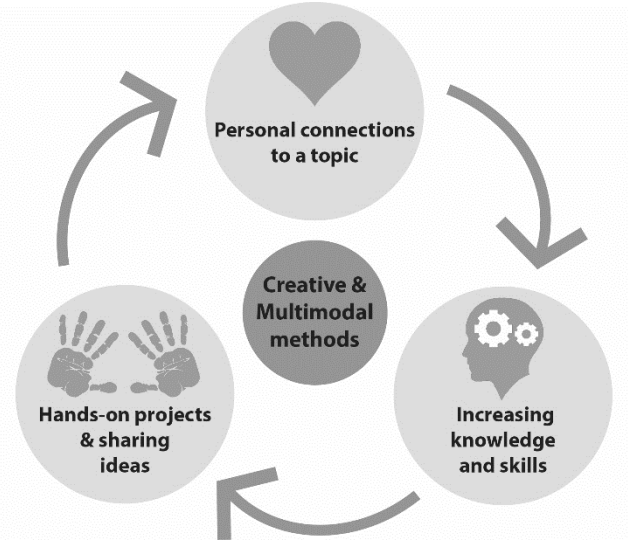


Figure 1. A Heart-Head-Hands Model for Engaging Young People

Explorations with Big Sur Charter School's 5th and 6th Grades

Methods

To explore environmental engagement possibilities for Big Sur Charter School, I conducted a pilot exploration with the 5th and 6th grade classroom in the fall of 2016. This pilot was conducted over two classroom visits of approximately 45-60 minutes each.

In the first visit (and as part of the "heart" model in Figure 1), students were asked to close their eyes and "think of a place that you love to be – think about what you are doing, who you are with, what it feels like, what you smell or see." Students then were asked to draw a picture of this place. At the outset, we briefly identified those issues that tied to the ocean or coast in some way, but students were not obligated to draw something connected to the ocean or coast. When students completed their drawings, they shared them with each other, telling the other students about the place they drew and why they drew it. At the end of individual sharing, each student then shared a connection they made to another students' drawing – the place or type of activity. After this session, I generated a word cloud of the places and activity words that students generated (Figure 2).

Figure 2. Word Cloud of Students' Favorite Places and Activities in the Region

In the second visit (which was to connect "heart" and "head" in Figure 1), students identified an issue that affects the health of the ocean or coasts. Because some students did not express much interest or connection to the ocean, the link between heart and head was somewhat weak and not emphasized. However, the process of generating interests (described below), served this purpose instead.

Students wrote ideas for what affects ocean or coastal health on sticky notes and posted as many ideas as they could think of on a sheet (Figure 3). Students then used green and red dots to identify the topics they thought were most important (red dots) and those that they wanted to learn more about (green dots). Students were given a maximum of 3 green dots and 1 red dot.

Based on the children's participation model for engagement, these initial visits were used to inform potential possibilities for learning center or coastal stewardship study.

Figure 3. Ocean Issue Brainstorming Sheet. Red Dots are Most Important Issues. Green Dots are those students were most interested in learning more about.

Results

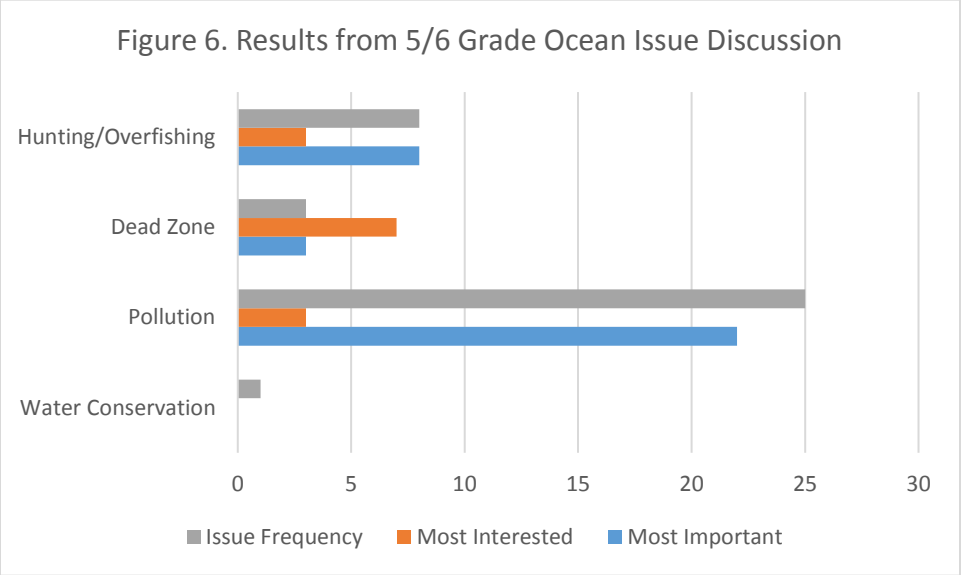
In response to the first activity, some students said they boogie boarded or visited the ocean-side often, spoke about visits to Morro Bay, or playing in the waves (Figure 2). Others had very little exposure, knowledge, or potentially interest, in the ocean and coast. A couple of students said that they lived in Salinas, so there was nothing to draw (meaning no outside places where they spent time). These students ended up drawing places out of the Monterey Bay region.

In the second activity, students identified several issues that affect the health of oceans and coasts, in order of frequency listed:

- Pollution – trash, litter, oil, plastics, dog waste, sewer water, industrial pollution (25 listings)
- Hunting, fishing, and over-fishing (3 listings)
- Dead Zones (3 listings)
- Harmful algal blooms (1 listing)
- Water usage – lack of water conservation practices (1 listing) (Figures 4, 5 and 6).

Figure 4 and 5. Details from Ocean Health Issue Identification Brainstorm.

Of those issues identified, students thought pollution was the *most important*, followed by (over-) hunting/fishing, and dead zones (Figure 6). However, students were *most interested* in learning about dead zones (7 students), followed by pollution and over-hunting/fishing (with 3 students each) (Figure 6).



Discussion

We learned a few things from this initial engagement process. Students have varied experiences with the ocean and coastal environment. While some students boogie boarded or visited the ocean-side often, others had very little exposure. This creates a challenge for traditional environmental education, in which lessons are delivered as a way of disseminating knowledge about the environment. But it creates an opportunity for participatory practices, which can meet students where they are and provide frameworks for students to deepen their own learning. I will provide recommendations for ways to achieve this in the next section.

It also appeared that students had limited knowledge of issues affecting coastal or ocean health, and that like experiences with the ocean, this knowledge varied quite a bit by student. With the initial prompt for issues affecting ocean health, the only factor that students came up with independently was pollution. This was a vague sense of pollution, rather than something specific to Monterey Bay. A few students, however, made detailed lists about the types of pollution affecting the oceans in general – such as plastic rings from 6-pack cans or plastic bottles (Figure 7).

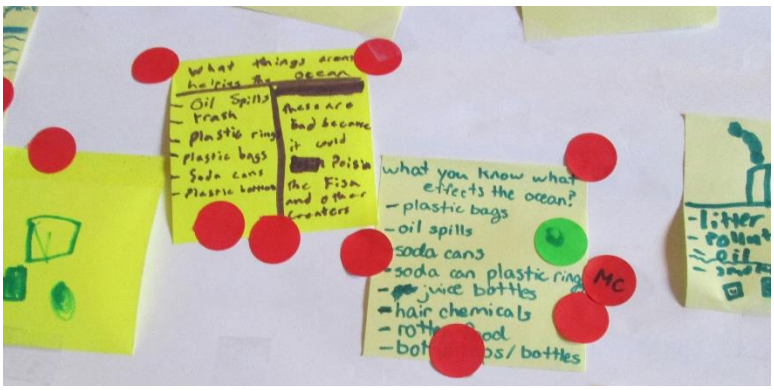


Figure 7. Detailed lists of sources of marine pollution.

Students arrived at the other issues – such as over-fishing or dead zones – after a series of prompts that I asked, that focused on students' observations, experiences, or uses of the ocean locally. One of these prompts was to ask students to think about what was special about the ocean in Monterey Bay – to which students fairly unanimously replied ocean life – fish, marine mammals – and to then ask students what they knew about these animals, which led to over-fishing, toxic algae, and dead zones.

In general, the discussion that followed indicated that much of students' existing knowledge is fairly generalized, rather than specific, even when I prompted them to talk about what they were learning from coastal stewardship about ocean health. It could also reflect the question that I asked - which may have been too abstract or that "issues affecting ocean health" was too problem focused. However, in the initial activity, students also reflected a relationship with the ocean and coast that seemed fairly superficial. The second activity further reflected this. However, and perhaps most importantly, students seemed genuinely interested in learning more, in thinking about what they could do, and in caring about these issues.

Recommendations

Following the model of young people's engagement, in which students not only take action, but play a role in shaping the topics and types of actions they might take, there is rich potential in exploring several different topics that relate to coastal stewardship, and a diversity of methods students could use to explore these topics. In general, my recommendations below are for ways to engage students with the "head" and "hands" part of the model for engagement (Figure 1), in response to previously identified topics. However, anyone could initiate this work from the beginning by following a similar set of steps as described in the methods above and then follow a similar framework of methods listed in this section for an entirely new engagement process.

No matter the topic, I recommend allowing students an opportunity to follow an issue through, from topic identification, to general questioning and interest, to a deepening of knowledge through research (interviews, guest speakers, field trips, or internet or library research), and to development of recommendations, campaigns, art, or local actions. These steps allow students to make connections to large scale issues but to find local actions that make a difference. By following a single issue through these phases, students not only can deepen their understanding of an environmental issue, but also think through the complexity of a problem and how to solve it while also engaging their hearts, heads, and hands. While many environmental problems are complex and hard to solve, this approach to student engagement provides students with an appreciation for how professionals are addressing a problem, as well as small actions that individuals or classes can take to make a difference. Ideally, students can share their ideas with a small team of visitors – a mix of parents, school administrators, and local experts who can hear what students have learned, listen to student ideas, and support discussion that acknowledges and supports student learning.

5th and 6th grade students had a number of questions for each of the topics that they said they would want to learn more about. The following are recommendations for the top three topics that students were interested in learning more about: dead zones, marine pollution, and overfishing. I also include information for harmful algal blooms. While this topic did not received top student rankings, I think it aligns with students' interest in the health of ocean animals that was reflected in their concern about over-fishing and is timely and relevant in Monterey Bay. Because choice in an important aspect of student ownership, selection of these topics should ultimately reside with the students; however, sometimes students do not have enough information to know if they would be interested or not, and so providing a brief overview of topics can be helpful at helping students arrive at their own informed choices.

Dead Zones. Students had many questions about dead zones – What causes them? How often do they occur? Do all the fish die in a dead zone? Once a dead zone is dead, what happens? Is it always dead? Is there something that can be done? Locally, Elkhorn Slough, because of its proximity to agricultural production in Salinas Valley and nutrient runoff into the slough, has been the primary focus of concern for dead zones, or *hypoxic* areas. A number of agencies and research entities are involved in studying and reducing the impacts of nutrient runoff to the slough. To learn more, students could:

- Interview a scientist from NOAA, Elkhorn Slough National Estuarine Research Reserve, or California State University Monterey Bay about local causes and concerns for the creation of dead zones in the Monterey Bay;
- Conduct research on the internet (using NOAA and Elkhorn Slough Foundation websites as starting points), and make a physical model for how dead zones are formed;
- Interview resource professionals or agricultural researchers about what is being done to reduce or prevent runoff that causes dead zones;
- Visit a local organic farm and asking how they address nutrient runoff; and
- Identify steps that students and families can take to help address the problem and then choose one of these steps for action. This could include writing letters to city councilors or county commissioners – or inviting them to class for a dialogue about what is being done and how to best protect the oceans from runoff; developing a school campaign to develop awareness and actions that other BSCS students can take; or making a mural or comic strip that educates others about dead zones.

Some resources about dead zones include:

- NOAA's website: http://oceanservice.noaa.gov/facts/deadzone.html
- Recipe for Hypoxia: Playing the Dead Zone Game by Jessica Kastler, *Science Activities* 2009.
- An Elkhorn Slough Report on Eutrophication: http://library.elkhornslough.org/research/bibliography/Elkhorn_Eutrophication_Report_Card_Tech_Report.pdf

Marine Pollution

Students listed a number of sources of pollution that could affect the coast and ocean. Some of these types of pollution were directly observed, and others were a bit more removed from students' direct experiences. Students did not seem to have a sense whether one type of pollution was most significant in the area. One student was particularly interested in dog waste and if it affected ocean or human health along the beaches and what was being done to prevent it. Of all the topics students expressed interest in, pollution is the easiest to tackle and directly link to actions. However, I would also caution that because of this, students often end up picking up trash along beaches, or think that this is the only possible way to address the problem. However, while picking up trash is always important, there are many other ways students could think about this issue. Some ideas include:

- Identifying key sources and impacts of pollution for the Monterey Bay. This could involve taking a field trip to the Aquarium and visiting the pollution exhibit and/or conducting internet research on the biggest sources of ocean pollution and those specific to the region. It could also involve researching microplastics and macroplastics and the sources and impacts of each;
- Conducting a home and/or school trash audit to see how and where trash goes and ways to reduce trash and waste;

- Conducting research at the beaches along the school to observe how or if trash is being generated – to understand sources of trash locally (this was a suggestion of one of the students in the class);
- Interviewing solid waste professionals from Monterey Regional Waste Management about plastic bag bans or recycling;
- Interviewing someone from NOAA's Marine Debris Program;
- Developing a trash mural (or other trash art) – a mural made of trash or recycled items that explains the problems (and potential solutions for) ocean pollution;
- Identifying local actions that students, families, schools, or the community can take to reduce pollution. These actions could be communicated through posters, brochures, or a creative zero-waste method, or through a campaign for a plastic-free month at schools or home to promote awareness about the pervasiveness of plastics as one form of trash that has significant impacts on ocean life.

Some resources for marine pollution include:

- NOAA's Marine Debris Program: https://marinedebris.noaa.gov/info/plastic.html
- NOAA's Ocean Pollution website: http://www.noaa.gov/resource-collections/ocean-pollution
- Monterey Regional Waste Management District: http://www.mrwmd.org/about/hours/
- World Wildlife Fund's Marine Pollution website: http://wwf.panda.org/about_our_earth/blue_planet/problems/pollution/
- Great Pacific Garbage Patch: http://nationalgeographic.org/encyclopedia/great-pacific-garbage-patch/ (Although this topic can be overwhelming and not a great starting point for inspiring action – depending on the student).

Over-Hunting and -Fishing

Students had a vague sense of the history of over-hunting and fishing, as related to the sea otter, for example, or the sardine fisheries. Students' interest in this topic reflected an overall interest in learning more about marine life and a desire to protect marine organisms. So while the topic was focused on over-hunting and fishing, it could also expand to include marine mammal protection, citizen science with marine mammals, or other efforts to conserve biological diversity of the oceans. Some potential activities include:

- Take the self-guided walk along cannery row to learn about the fishing history of the area;
- Take a field trip to Whaler's Cove in Point Lobos and learn about whaling and abalone fishing histories;
- Invite a local historian or community member to speak to the class about the history of fishing in the area;
- Interview a local fisherman, someone from Monterey Fish Company, or other local fish markets about how they ensure the sustainability of the fish stocks;
- Invite someone from the Monterey Bay Fisheries Trust (which includes scientists as well as the Monterey harbormaster) to talk about how they protect fisheries, or invite someone from the US Fish and Wildlife Service to talk about how they manage fisheries; and
- Make an interactive food web or game that describes the history and best practices of fisheries and what a healthy food system looks like in Monterey Bay. Or a comic that chronicles this history.

Some resources on sustainable fishing include:

- Cannery Row history: http://canneryrow.com/our-story/the-canneries/
- NOAA's Monterey Bay National Marine Sanctuary website: http://montereybay.noaa.gov/resourcepro/resmanissues/fishing.html and Fishing Impacts site: http://sanctuaries.noaa.gov/science/sentinel-site-program/monterey-bay/fishing-impacts.html
- Monterey Bay Fisheries Trust: http://www.montereybayfisheriestrust.org/who-we-are-1
- US Fish and Wildlife Service: https://www.fws.gov/cno/ or https://www.fws.gov/ventura/
- Sustainable Seafood Monterey: https://www.seemonterey.com/food-wine/features/sustainable-seafood/
- Monterey Bay Aquarium Sustainable Fisheries Program: https://www.montereybayaquarium.org/conservation-and-science/our-priorities/sustainable-fisheries-and-aquaculture
- Monterey Bay Aquarium's Seafood Watch program: http://www.seafoodwatch.org/ and Educational Resources: https://www.seafoodwatch.org/resources/educator-resources
- Monterey Wharf: http://www.montereywharf.com/

Harmful Algal Blooms

Students observed that algae is often seen in the Monterey Bay during certain times of year. Some said that this is a normal part of the seasonal cycles of the bay. Others were less certain. Locally, harmful algal blooms that contained domoic acid resulted in a large-scale shut down of West Coast fisheries in 2015-2016. In Monterey Bay, this affected the Dungeness crab market. Domoic acid is a neurotoxin that can accumulate in shellfish and lead to the death of seabirds and marine mammals and can affect human health. To learn more, students could:

- Interview a scientist from NOAA, the California Fish and Wildlife Department, and/or a local Dungeness crab fisherman about the causes and prevention of harmful algal blooms;
- Conduct some internet research, using NOAA's Harmful Algal Blooms site and NOAA's Northwest Fisheries Science Center's Curriculum, which contains video information;
- Invite a guest for a question and answer about what is being done – either from a local source or through a skype call with a scientist in the Northwest Fisheries Center; and
- Identify action – is there anything that can be done to help prevent these blooms? Scientists are still trying to identify exact causes of the blooms, so this is a question that students might not find an immediate answer to. The action might be further research or a citizen science project.

Some resources about harmful algal blooms include:

- KRON 4 news video about Dungeness crab season 2016:
- http://kron4.com/2016/11/15/dungeness-crab-season-officially-begins/
- NOAA's website: http://oceanservice.noaa.gov/news/sep15/westcoast-habs.html
- NOAA's Northwest Fisheries Science Center website: https://www.nwfsc.noaa.gov/hab/index.cfm and curriculum: https://www.nwfsc.noaa.gov/hab/outreach/education.cfm
- California Fisheries Fund: http://www.californiafisheriesfund.org/reso_atlas_crab.html

Finally, if students had different areas of focus, a class could use the overall framework – identifying a passion project, conducting research through field trips, local experts, and internet or library sources, and then developing an action plan. Students could develop a poster, a powerpoint presentation, or a model for action. Each group could contribute a one page list of facts and recommendations that could be compiled and distributed. A class as a whole could then host an open house to invite families, school administrators, and community members to share their ideas and promote further action. To bring student work full-circle (back to the heart), students should select methods of communication that best suit their own interests and creative expression.

Conclusion

Big Sur Charter School has a rich potential to explore possibilities for environmental engagement as proposed in this report, in which students play an active role in shaping the topics and types of actions for environmental learning. BSCS's flexibility within the curriculum, student- and family-driven projects, and a commitment to coastal stewardship provide an important context for participatory, engaged environmental education. This report summarizes interests of the 5th/6th grades for learning more about ocean health in Monterey Bay. However, this process could be applied to a wide range of issues in addition to ocean health, from those that address urban planning or park design, those that focus on coastal dune restoration or wildlife habitat, or those that address food systems and health. The key message is that young people can be effective environmental leaders and want opportunities to explore issues and take action as a part of their education. Frameworks that support active citizenship and provide opportunities for choice and leadership allow young people to do this.

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