UNIVERSITY OF CALIFORNIA, IRVINE

Operationalizing environmental education:
Informal ocean & coastal education in Orange County

THESIS

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MASTER OF ARTS

in Social Ecology

by

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DEDICATION

To

my family,

inherited and chosen,

you are my light.
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ABSTRACT OF THE THESIS

Operationalizing environmental education:
Informal ocean & coastal education in Orange County

By

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Master of Arts in Social Ecology
University of California, Irvine, 2019

Professor Richard A. Matthew, Chair

This project investigated the landscape of motivations, strategies, and goals of informal ocean science centers in Orange County, Ca. The projected is situated within a larger context of expectations and definitions of environmental education, and the knowledge-to-action pathway, framed by education and social movement mobilization theories. The objective was to understand how ocean education is put into action on-the-ground across the county, and how cohesive the expectations for outcomes are within the environmental education for sustainability framework. Director or equivalent level employees of five centers were interviewed. While the centers’ missions vary, they all hope for ultimately the same things, employ similar strategies, and programs address similar issues. Responses indicate, first, that integration with formal schooling while a factor in content creation helps bolster the efforts of environmental education but also highlights a need to attend to both formal and informal structures for broader social and environmental change. Second, emotional connection is considered a critical element to move visitors to action. Third, the center-based informal ocean educators serve or intend to serve as change incubators for improved knowledge formation, delivery, and training.
Operationalizing environmental education:  
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“The ultimate aim of education is shaping human behavior. Societies throughout the world establish educational systems in order to develop citizens who will behave in desirable ways” (Hungerford & Volk, 1990).

“If there is a genius in organizing, it is the capacity to sense what it is possible for people to do under given conditions, and to then help them do it. In point of fact, however, most organizing ventures ask that people do what they cannot do, and the result is failure.” (Piven & Cloward, 1977, 22)

Environmental education has struggled with finding a balance between traditional concepts of education and those more often associated with mobilization (e.g. Roth, 1973; Hungerford & Volk, 1990; Bonnet, 1999; Levy & Zint, 2013). To this day, environmental education has no one settled definition or purpose. Scholars and practitioners alike stumble over nuances in definition, practice, assessment, and valuation when targeting both children and adults (e.g. Kopnina, 2012; Sauve, 1996; Ballantyne & Packer, 2005). Even so, education has previously been and continues to be touted as a necessary, if not sufficient, strategy to transition to a sustainable society, globally (e.g. Bonnet, 1999; United Nations Environmental, Scientific and Cultural Organization [UNESCO], 1975; UNESCO & UNEP, 1978; World Commission on Environment and Development [WCED], 1987). While it is hard to deny either the need or the important role education plays, so too is it difficult to point to exactly what its role looks like. One challenge, in particular, is how muddy the waters are between the inputs to knowledge attainment and the outputs of action.

Environmental education sits somewhere in between the two aforementioned realms, education and mobilization, sometimes more on one side than the other depending on who is providing the programming. Regardless of its dynamic positioning, the field itself continues to be critical to governance of wicked problems like climate change which will require solid
understanding of complex scenarios made up of complex interconnected factors (e.g. Schreiner, Henriksen, & Kirkeby Hansen, 2005). In democratic nations, specifically, it should follow that anyone involved in making decisions or voting for people who will make those decisions should possess an appropriate level of understanding of those issues (e.g. Dryzek & Pickering, 2016).

The idea behind this paper is that, in such a loosely defined yet crucial sector of society on which we place so much weight for future environmental health and sustainable global communities, we need to also consider how the institutions operating within it make sense of what they are doing and what their roles are. From this, we could perhaps have a more complete but also more realistic image of what we can get out of education, or what pressure or expectations we can continue to place on this sector as one of our saving graces for the decline of the environment and society’s tandem spiral downward. We could determine how to either work within the current community and framework of environmental education on-the-ground or if something new or additional is needed in the puzzle.

In this paper I will first review a brief history of the development of environmental education. Then, I will consider an education and a social movement perspective on inciting people to action, as well as challenges in evaluating the effectiveness of knowledge to incite action. The final sections of the literature review will situate non-formal environmental education organizations as the focus of this study and introduce a particular branch of environmental education through which the project will examine the questions and objectives noted above.

**Literature**

We are living in an increasingly science and tech driven society which is also facing global environmental and social challenges to which both natural and social sciences offer
explanations and potential solutions. National surveys in multiple countries have indicated, though, that huge portions of the population either have little knowledge of the issues or of their scientific fundamentals, or do not take interest in them (Miller, Pardo, & Niwa, 1997). How can global environments be sustained if the decisions being made concerning the challenges mentioned above are being made by a population without sufficient understanding of or interest in the facts or processes behind those facts. Jon Miller categorizes this quality as a low level of civic scientific literacy (CSL), a concept he defines as the “level of understanding of basic scientific constructs that an individual would need to access and make sense of information about public policy issues involving science and technology (Miller, 2016). Miller identifies spectrums of attention, interest, understanding, and knowledge. This suggests that there may be multiple points of entry for raising CSL, and that raising CSL in a community has potential to increase climate resiliency via civic engagement that favors positive interactions with the environment and community or positive environmental behavior changes (Miller, 1998).

Environmental education: A brief origin story

What is the point of environmental education, broadly, as a concept? The answer varies slightly depending on who you ask and when you asked them. This brief and non-exhaustive history and evolution of environmental education will offer some background for this paper. Skipping ahead of the earliest influences on the need for education about the environment, this historical discussion will start in 1948 at the conference to establish the International Union for the Protection of Nature (International Union for the Conservation of Nature or IUCN as we know it today). Here, Thomas Pritchard used is said to have first used the phrase “environmental education”, at least in a professional setting (North American Association for Environmental Education [NAAEE], n.d.a).
Since IUNC used the term, environmental education organizations both global and small scale have outlined and re-outlined the definition, purpose, strategies, and goals of the practice of environmental education. They range from awareness raising of conservation topics to something much more inclusive of broader social change (IUCN CEC, 2011, p. 26). To illustrate, I will present a chronology of the development of environmental education.

- **1972**- The Stockholm Declaration calls for environmental education for adults and children so that humankind can learn to manage and control the environment in collaboration with nature (United Nations, 1973). The document asserts that environmental education is “essential in order to broaden the basis for an enlightened opinion and responsible conduct by individuals, enterprises and communities in protecting and improving the environment in its full human dimension.” (United Nations Environment Program, 1972, p. 3).

- **1975**- The Belgrade Charter lays out a basic structure for environmental education: "[t]he goal of environmental education is: To develop a world population that is aware of, and concerned about, the environment and its associated problems, and which has the knowledge, skills, attitudes, motivations and commitment to work individually and collectively toward solutions to current problems, and the prevention of new ones." (UNESCO, 1975, p. 3). The objectives also specify a participation element in which environmental education should develop in participants responsibility and urgency, so action is taken to solve environmental problems (p. 3-4).

- **1977**- The Tblisi Declaration is often cited and considered the “definitive statement on what EE[environmental education] ought to be,” (NAAEE, n.d.a.) as it breaks down in great detail goals, objectives, guiding principles as well as expectations for UN member
states, formal educators, and non-formal educators. The recommendations acknowledge nearly every angle of the environmental education endeavor. In this declaration, the goals of environmental education are: “(a) to foster clear awareness of, and concern about, economic, social, political and ecological interdependence in urban and rural areas; (b) to provide every person with opportunities to acquire the knowledge, values, attitudes, commitment and skills needed to protect and improve the environment; (c) to create new patterns of behavior of individuals, groups and society as a whole towards the environment” (UNESCO & UNEP, 1978, p. 26). The categories of objectives in this declaration are awareness, knowledge, attitudes, skills, and participation and their definitions closely mirror those from the previous Belgrade Charter.

• **1987**- The Bruntland Report doesn’t offer a definition or set and goals outright for environmental education, but states that “[r]eversing unsustainable development policies at the national and international level will require immense efforts to inform the public and secure its support” (WCED, 1987, p. 326). It says that “[t]he changes in attitudes, in social values, and in aspirations that the report urges will depend on vast campaigns of education, debate, and public participation” (WCED, 1897, p. xiv). In this, we can see continued recognition that education has a role to play in improving chances for a socially, economically, and environmentally sustainable future.

• **1992**- Agenda 21, published after the UN conference in Rio de Janeiro, echoes the Tblisi Declaration but moves further in the direction of achieving broader sustainability rather than only overtly defining environmental education. This document identifies a difference between environmental education and education for sustainable development, referring to them by separate names, but attributing the same importance to them as
educational endeavors. Agenda 21 states, “[e]ducation is critical for promoting sustainable development and improving the capacity of the people to address environment and development issues.[…] It is also critical for achieving environmental and ethical awareness, values and attitudes, skills and behavior consistent with sustainable development and for effective public participation in decision-making” (UN, 1992, paragraph 36.3). Countries are also encouraged to mobilize different audiences and communities to “assess their own needs and to develop the necessary skills to create and implement their own environment and development initiatives” (UN, 1992, paragraph 36.5).

- **1997**- The Declaration of Thessaloniki reaffirms the importance of environmental education but recommends reframing it as education for environment and sustainability. This document also identifies education and public awareness as two of several critical components for “rapid and radical change of behaviors and lifestyles” (UNESCO, 1997, p. 1).

- **2002**- The United Nations establishes a Decade for Education for Sustainable Development for 2005 to 2014 which aimed to “integrat[e] the principles and practices of sustainable development into all aspects of education and learning, to encourage changes in knowledge, values and attitudes with the vision of enabling a more sustainable and just society for all.” (UNESCO, 2014b, p. 5)

- **2009**- The North American Association for Environmental Education, a prominent professional organization for Canada, Mexico, and the United States, publishes several documents outlining guidelines for excellence in environmental education. Their foundations are the Belgrade Charter and the Tblisi Declaration. These guideline
documents describe the goal of environmental education as developing an environmentally literate citizenry (NAAEE, 2009a and 2009b), saying that “[a] knowledgeable, skilled, and active citizenry is a key to resolving the environmental issues that promise to become increasingly important into the next century” (NAAEE, 2009a).

- **2013 & 2014** - UN Environmental Program and UNESCO documents outline more specific definitions of education for sustainable development as something that “empowers everyone to make informed decisions for environmental integrity, economic viability and a just society for present and future generations, while respecting cultural diversity” (UNESCO, 2013 as cited by UNESCO, 2014a).

- **2015a** - The Paris Agreement includes an item in which signing parties will “enhance climate change education, training, public awareness, public participation and public access to information, recognizing the importance of these steps with respect to enhancing actions under this Agreement” (United Nations Framework Convention on Climate Change [UNFCCC], 2015, Article 12, p.28). Here, the aims of the Agreement are ultimately “to strengthen the global response to the threat of climate change, in the context of sustainable development and efforts to eradicate poverty” (Article 2, p. 22).

- **2015b** - The United Nation’s Sustainable Development Goals (SDGs) are adopted as part of the 2030 Agenda for Sustainable Development by leaders around the world (UN Environment, n.d.). There are seventeen goals, each with multiple targets. Each goal’s total success depends on trade-offs with the others, indicating the critical need for integrated, science-based, nexus-thinking governance (Müller, Janetschek, & Weigelt, 2015). SDG 4 explicitly calls for “all learners [to] acquire the knowledge and skills needed to promote sustainable development, including, among others, through education.
for sustainable development and sustainable lifestyles, human rights, gender equality, promotion of a culture of peace and non-violence, global citizenship and appreciation of cultural diversity and of culture’s contribution to sustainable development” by 2030 (UN Environment, n.d). So, while ambitious targets of the SDGs include the provision of education, generally, as a target itself (SDG 4), they also require education as a critical support.

• **2019**- The current UNESCO website says that “[e]ducation is an essential element of the global response to climate change. It helps people understand and address the impact of global warming, increases “climate literacy” among young people, encourages changes in their attitudes and behavior, and helps them adapt to climate change related trends. Education and awareness-raising enable informed decision-making, play an essential role in increasing adaptation and mitigation capacities of communities, and empower women and men to adopt sustainable lifestyles.” (UNESCO, n.d.).

To summarize the development of environmental education since 1948, each new declaration came with a reaffirmation of the importance of environmental education for a sustainable world paradigm, recommendations for what it should look like and who it should be for, and why nation states should support local, regional, national, and international-scale efforts. While the definitions evolved, the new conceptualizations did not overtake or replace those that existed prior. As such, there are contemporary activities that are guided more by either environmental education or more specifically by education for sustainable development. Variance in execution will be accounted for by which particular flavor of environmental education the definer subscribes to. Branches of environmental education further within these two perspectives, for example urban environmental education, have been defined as “any
practice that creates learning opportunities to foster individual and community well-being and environmental quality in cities,” which “creates opportunities for community members to come together around local environmental restoration, planning, policy, and other environmental actions. In these ways, urban environmental education contributes to urban sustainability and resilience.” (Russ & Krasny, 2017). In conservation education, as the name would suggest, education serves a specific purpose- to help increase conservation efforts.

For an organization with a conservation/development mission, where people’s willing cooperation is central to its long-term and sustained achievement, not to have an educational component to conservation activities might seem perverse for the simple reason that people’s understanding (heart and mind; affective and cognitive) of why conservation is important is crucial to the achievement of the wider conservation goal, and enabling and engendering understanding is the role of education, whichever of many forms it might actually take on the ground.” (Fien, Scott, & Tilbury, 2001, p. 383).

Hungerford (2009) makes the claim that “[a]ll of these varied approaches, along with their advocates, resulted in a poorly defined mixture of philosophies about where EE should be headed.”

Whether practitioners consider themselves as being in one camp or the other, or if they see the need to draw the line between two intimately related endeavors in the way that the Academy or global institutions do, remains to be known. Fraser, Gupta, and Krasny (2015, citing Sauve, 1999) agree that the “definitional problem” is not so much that there is a variety of definitions, but that there is a gap between the discourse and practice. We may, though, see hints at which side the practitioners lean towards when we consider how much their outcomes strive towards broader social changes or more specific environmental outcomes.

Fraser, Gupta, and Krasny (2015) found five overarching perspectives of what the purpose of environmental education is as defined by a broad range of environmental educators. The perspectives on purpose are as follows: 1) environmental education supports sustainable
lifestyles and maintenance of human and non-human nature through pro-environmental behaviors, 2) it facilitates spiritual connections and appreciation of life, 3) supports moral development as there is an ethical responsibility to solve environmental problems, 4) it empowers communities to address their needs and motivates them towards environmental justice efforts, and 5) establishes a natural-systems based moral guide to help solve environmental problems. The authors go on to say that these perspectives, individually, actually cross the divide between the dominant emancipatory and instrumental camps of the field of environmental education research. Their explanation for this “unexpected result” is that those two dominant perspectives are separated by the scholars who defined them, not by the practitioners who implement them, and that practitioners don’t necessarily make such a distinction.

Instrumental environmental education has certain desired behavior outcomes planned in advance. The teacher designs a step-by-step experience to achieve those outcomes. In the emancipatory category, the outcomes are left more open ended so that they may respond to the complex needs of the learners and dynamically adjust to them as they change during the program. Examples of the latter would be civic ecology or community gardening. A third category of environmental education is a combination of instrumental and emancipatory (Wals et al, 2008, cited by Silva & Laird, 2017, p 181).

West (2015) similarly asked both practitioners and participants of a non-formal environmental education program what the possible outcomes of environmental education are. All responses, from both groups, could be placed into four categories: 1) for the environment, 2) for individuals, 3) for the wider community, or 4) for the institution running the program. Participants tended to emphasize outcomes that were for the individuals partaking in the program, while practitioners emphasized outcomes for the environment more frequently in the
questionnaire portion of the study and outcomes for individuals in the focus group portion. Those two categories were the top two in any case. However, the overall top outcome, not category, was increasing environmental knowledge; it was identified as being the most important by practitioners.

Highlighted by the latter two studies, but also by the general absence of comparisons of the perspectives of global institutions and of individual organizations in the literature is the apparent misalignment of perceived goals of environmental education at the various levels of the field. It also brings up the question: Are the intentions and practices of environmental education practitioners ascribed in global frameworks? Or are they grounded in the actual perspectives and definitions of that group? While it is possible to find papers detailing beliefs of environmental educators as individuals (e.g. Taylor & Caldarelli, 2004; Taylor, 2006) or what they personally think goals of environmental education are (e.g. West, 2015), it has proven more difficult to find studies of organizational perspectives, methods, and goals. To begin filling this gap in the literature, the study described in this paper will seek out such perspectives. Only from understanding where everyone at each level in the field stands can the gap between discourse and practice be bridged.

Knowledge & action

The various goal driven definitions of environmental education in the previous section often include some action-oriented element. The emphasis on an intimate connection of knowledge and action makes environmental education and its sub-fields an interesting and telling case to examine the knowledge-to-action pathway. Naturally, the objectives of environmental education will favor pro-environmental ideals. These are best seen in targeted behavioral changes but also in civic engagement, as big changes or strategic changes will only take place if
movement happens at the government and industry levels of society which requires concerted civic engagement (Chawla and Cushing, 2007). The actions included in the various definitions above ranged from changing individual behaviors to political action, and from conservation work to protests.

As previously mentioned, the North American Association for Environmental Education, a leading professional organization for the USA, Mexico, Canada, and, increasingly, the world, bases their best practices on the foundation established by The Belgrade Charter and The Tbilisi Declaration (NAAEE, 2009a). Using these ideals, they continually work to produce guiding documents to practitioners for conducting environmental education programs to achieve goals in alignment with said declaration. The latest guidelines (NAAEE, 2009a) include descriptions of important characteristics a program or lesson should have. While they dedicate a section to action-orientation, methods to be successful in having learners carry out those actions are absent or very superficial; there is nothing indicating how best to actually move learners to action.

So, on the one hand, there are no clear-cut pathways outlined to either increase awareness about climate change nor to increase understanding of the topic. On the other hand, understanding the necessary and sufficient motivators of either individual behavior changes or of partaking in advocacy has not been precise or complete. The connection(s) between these two hands, the heart and soul of the endeavors of environmental education, is the muddy puddle that researchers are still sifting through. The links between the two sides are arguably dependent on which level of action is desired; taking up individual lifestyle or behavioral changes is not necessary to become an advocate for the issue and not all who make individual changes want to be advocates. These two actions are on the same side of the equation for both can be understood as outputs of awareness and understanding. But, the strategies behind increasing awareness and
understandings are often not well understood themselves nor is the method by which that is translated to the world of action.

**How is action incited?**

**Education?** Within the educational literature, often specific to environmental education, there is an emphasis on defining components of the learning models that lead from knowledge to action. A common model is the deficit model. Using the deficit model as a foundation, environmental educators contrive that if people, the lay public, only knew and understood more about the topics and connections to behaviors that drive climate change, then they will take actions that support mitigative efforts (Burgess et al, 1998; Kollmuss & Agyeman, 2002).

Practitioners in one study (West, 2015) seemed to follow the prominent information-deficit model to encourage pro-environmental behavior so much so that while environmental behavior change wasn't discretely listed by educators as a possible outcome of environmental education very frequently, but increased knowledge was. The author wrote, though, that the phrasing used by the respondents revealed an underlying assumption that knowledge will lead to behavior. Schriener, Henriksen, and Hanson (2005) describe a similar knowledge deficit as an obstacle to climate education for empowerment, as well as low understanding on the part of participants in programs of how to apply any knowledge they do have to decision-making situations. So, there is also a more practical deficit.

The truth behind and appropriateness of the deficit model’s foundation comes into question as more examples accumulate of well-informed folks who have plenty of knowledge, understanding, belief, and concern that, under this model, we would expect them to be great stewards of the environment and make choices that support sustainability, but who actually do not. Regardless of their level of knowledge about scientific process, environmental issues, social
impact on environment, or of the physical earth processes, citizens continue to engage in irresponsible environmental behaviors or take no action on the issue, or simply change nothing about existing behavior (Finger, 1994; Jordan et al., 2011). This can be thought of as “environmental hypocrisy” or “environmental dissonance”. This means that the traditional deficit model of environmental or science education for action is missing some links in the knowledge-practice pathway.

Hungerford and Volk (1990) offer up a more detailed model to try to address these very issues. Their model, while still linear, tries to account for more complex variables that help to predict environmental behavior change. They conclude that, “instruction must go beyond an ‘awareness’ or ‘knowledge’ of issues. Students must be given the opportunity to develop the sense of ‘ownership’ and ‘empowerment so that they are fully invested in an environmental sense and prompted to become responsible, active citizens” (p. 17).

Researchers have also suggested emotions as an additional, perhaps key, mediating variable. The way people feel about the environment is an important factor in their attitudes toward the environment (Pooley & O’Connor, 2000; Stern, 2000; Luebke et al, 2016).

As far as teaching approaches go, even within a place-based, visitor center style location, the field employs various strategies or models of teaching. There are more traditional, lecture-based lessons, passive exhibitry panels, inquiry-based models, participatory lessons, and more active hands on (a type of participatory methods) approaches, as well as combinations of these and others. Literature generally posits that experiential and more active methods will be more effective at increasing knowledge or creating deeper and/or longer lasting impacts on participants. Further, immersive, experiential, and participatory programs have been shown in
small sample studies to increase participants understanding as well as increase pro-
environmental attitudes, behavior, and values (Manoli et al., 2014).

Among teaching practices identified as being critical to successful environmental
education, May (2000), identified experiential teaching style, “consistent can-do vision”,
“infectious passion” for teaching, and personally practicing pro-environmental behaviors (8).
This hints towards something other than increased knowledge as being a mediating factor in the
pathway to action. Situational and instructor characteristics as mediators has been addressed in
learning theories but seems to generally be absent from most models of environmental education
for action.

What this has all highlighted is that the learning model for environmental education that
produces action, the knowledge to action pathway, cannot be isolated from other factors. There
are internal and external mediating variables that have not all been accounted for in the past or
even identified as of yet. Practitioners and researchers alike are still trying to make sense of how
best to achieve the pro-environmental behaviors as a result of environmental education
programming. Investigating what education organizations are currently doing in a more in-depth
way, my study hopes to add to this conservation.

Mobilization? While much of the literature I have brought up so far, and much of what
will come, has been more from the education fields of research, another body of literature could
potentially help us to understand how people are moved to action- social movement mobilization
literature.

One caveat to the inclusion of this body of literature in this particular paper is that
mobilization from the social movement perspective applies at the scale of some collective group
and not on the individual as in educational theories (Meyer, 2015). As environmental education
hopes to make change on a collective scale but often targets individuals, there is, I think, space in this field for the two perspectives to talk to each other.

Most relevant to our discussion from mobilization research is the concept of framing. For the purpose of this paper, we will focus on rather simplified explanations within framing with the intention of identifying points where education and mobilization theories could best support and explain how, in the field of environmental education, educators can move learners to action. It should also be made apparent that there is no intention for the study described in this paper to be evaluative; the theory coalescence may simply offer points of discussion for what will be described in the results section.

Framing and frame analysis. To make sense of the mechanics of social movements, how they develop, how they bring people in, and how action is taken, scholars of social movements have developed, among others, the concept of framing. There are multiple levels of framing: a) diagnostic: something is problematized and the cause of that problem is identified; b) prognostic: a solution to the problem is put forward as are strategies for achieving the solution; and c) motivational: the “call to arms,” motivation to engage in collective action (Benford & Snow, 2000). Together these stages address what Klandermans (1984) describes as mobilization of both consensus and action. Benford and Snow (2000) also define collective action frames as “action-oriented sets of beliefs and meanings that inspire and legitimate activities and campaigns of a social movement organization (SMO)” (p. 614). Together, in short, framing presents one way of understanding how people are moved to action.

The way content is framed in programming makes a difference when the objective is pro-environmental behavior. To highlight this, Buttel’s (1975) study found that certain frames became less relevant or even off-putting to certain audiences as the environmental movement’s
problem framing began to threaten a previously supportive base’s livelihood. So, it is important for educators to be able to adjust their framing to their audiences as much as possible if they want to maximize impact. Cox (2010), who calls for highly strategic mobilization to achieve change at the systems-level scale, recognizes, still, the importance of framing. Public attitudes need to align with and support the plans for broader change for it to actually happen.

How separate are the latter two sections, education and mobilization? Holford (1995) may likely argue, not at all. Seeing the intimate connection between, specifically, adult education and social movements, Holford set out to investigate a new way to interpret social movements and the impact that interpretation would have on the understanding of adult education. Noting, first, that social movements actually create new knowledge, Holford said studying the education and educators of social movements, “movement intellectuals”, would allow one to learn about both the movement itself and the knowledge it creates as well as, perhaps, discover innovative educational approaches. In his concluding remarks, he says, “adult educators can be central to the emergence of new knowledge in society, and to social change itself. ” (p. 109). It would seem, to me, that environmental education is framing in action.

**Indoctrination?** Within the literature you will find a debate over what I consider to be the ethics of environmental education. This debate’s main item of concern is the ultimate purpose of environmental education as reflected in the goals of educators. Roth and Lee (2004) interrogate the debates over definition, practice, and assessment when searching for a way to ensure seamless transition in the practice of science and use of scientific knowledge from school age to adulthood. One particular dilemma they discuss is whether environmental education or scientific literacy should be or are inherently designed and implemented with the intention of changing behaviors or if it should focus on developing critical thinking.
On one side, there is a concern that if educators are educating for specific behavioral outcomes that are in alignment with their own idea of pro-environmental behavior, then it is no longer purely education but is rather indoctrination. Such methods and tactics become mere tools by which to achieve certain eco-moralistic policy (Jensen & Schnack, 1997; Hart, 1992; and Simovska, 2008 as cited by Laessoe, & Krasny, 2013).

This concern echoes the ideals put forth by Dewey, a historically important player in the field of education at large. Several of his ideas are relevant for this argument. He posits that education exists within the frame of democracy. As such, there is the “necessity of personal and voluntary participation in reaching decisions and executing them” (1937, p. 473). This phrasing gets at the crux of the indoctrination conversation within environmental education. Should the goal of environmental education be to train and mold learners to exhibit specific environmental behaviors and ideas? Or should the outcome be to teach learners to think critically about the environmental issues we are faced with and come to a decision on their own as to what the solution should be and if they should execute it?

Krasny and Dubois (2016) suggest that at this stage of the climate change issue, we cannot afford to not teach to change behaviors, but that both styles, embedding action and developing critical thinking, are required to address both adaptation and mitigation efforts. Similarly, Cox (2010) says in his discussion of the need for more strategy beyond framing for mobilization for environmental progress that the time scale and scope at which change must happen relies on the use of multiple strategies simultaneously. Considering that active participation in democracy is really what will help move environmental improvement forward (Chawla & Cushing, 2007), the inclusion of civic participation, of local involvement, the broad issue-inclusive/interconnection with other social and political issues is quite necessary in
educational environments where the alternative is more purely a transmission model. This may mean that the education identity of environmental education cannot be thought of in the same way that Dewey (1937) and traditionalist think of "pure" education.

This debate, though, needs to also consider several important interpretations and findings. Some research (Finger, 1994; Jordan et al., 2011) indicates that information and knowledge acquisition alone has not actually been found to be a motivating factor for pro-environmental behavior. In the case of Finger’s 1994 study, the exception was the small percentage of his study population which was already involved in mild activism or protest behaviors, and in fact seeking information seemed to replace action-taking as an outcome rather than being a motivator for action. For Finger’s population, the life-world experiences, environmental experiences specifically, were the strongest predictors of environmental behavior.

Further, Jensen (2002), says the aim of environmental education is teaching skills to be able to do those behaviors. That is, to give learners the competencies which are necessary for the behaviors the educators identify as helpful, but not indoctrinating them or brainwashing them to act only in those specific ways. Similarly, Roth and Lee (2004) say educators “set up situations that allow a variety of participatory modes, more consistent with a democratic approach in which people make decisions about their own lives and interests” rather than “coax[ing] individuals into certain performances” and that “[i]f we wish science education to be relevant to people’s citizenship and their everyday lives, we do well to allow the learners to participate in a diversity of these relations: expecting one set of relations (institutional school) to prepare students for a world of many relations does not make sense” (p. 267, all emphases original). It seems then that there is still a voluntary element, insomuch as education as an institution allows for pure free thinking and behavior.
Does it work? How do we know?: Evaluation and measuring success

Learning more about what program methods work for which category of outcomes and the mechanisms behind that success requires evaluation and re-evaluation. Further defining and outlining the knowledge-to-action pathway in the environmental education field relies on the evaluations that illuminate the links between either end of the equation. I will focus on a broader picture question to follow up on previous sections: Does environmental education programming have action outcomes, even if that pathway cannot be fully delineated?

Evaluations may be conducted by an environmental organization itself or by external bodies. The intention of evaluation depends on the evaluator’s interests. In the broader field of education, the goal is, in the simplest terms, that something has been learned. In the environmental education field, that which has been learned can generally, again in the simplest terms, be categorized as either knowledge, attitudes, behavior, or skills (UNESCO & UNEP, 1978). Ardoin et al (2018) conducted a systematic analysis of research papers that had conducted some evaluation of environmental education on K-12 participants. In their sample, which included only evaluations looking at “measurable” outcomes, they found that the outcomes being measured could all be categorized as knowledge (68%), dispositions (61%), competencies (26%), behavior (20%), multiple domains/categories (6%), and personal characteristics (3%). While certainly less common, more holistic evaluations of the effect of environmental education experiences can be found (e.g. Finger, 1994; Winklerova et al, 2018; Manoli et al 2014). The benefit of the latter approach is offering the space for hitherto unidentified or unproven impacts of environmental education to be revealed. This is particularly important for more clearly identifying the combination of factors that lead to pro-environmental attitudes and behaviors.
Evaluations of post-program knowledge retention or behavior change are most often conducted immediately at the end of the program and more delayed evaluations are conducted within 1-6 months (Ardoin, et al, 2018; for examples see e.g. Dierking et al, 2004; Nussbaum et al, 2015; Ardoin, Schuh, & Khalil, 2016; Gutierrez de White & Jacobson, 1994; and Manoli et al, 2014 ), fewer still make retrospective analyses of environmentally conscious people’s life trajectories (e.g. Winklerova et al, 2018). The point here is that the field has much less understanding of what promotes long-term retention and, by extension, real change in the world. It follows, therefore, that for developing the field and the understanding of what factors move participants in environmental education programs to action, the type of evaluation model used and the subject of the evaluation matters.

Dierking et al (2004) found there to be behavioral implications of a program operated by Disney’s Animal Kingdom in the short term, but almost all long-term impact decreased. Others (e.g. Jordan et al, 2011) have found that some more “passive” behaviors were adopted such as talking to others about the subject after participating in a program. Jordan et al also found that, while knowledge increased, there was no increase in a sense of efficacy among participants which participants attributed their lack of more active behavior to. Smith et al (2019), in their evaluation of an interpretive sea turtle program that measured knowledge, attitudes, intention to act, and actual long-term action, determined that 76.7% of participants who agreed to be contacted after the program did report having performed certain behaviors beneficial to the sea turtles and their environment six months after the program. While this is promising, the authors also address a concern in the field of environmental education and evaluation that there was potentially a bias in their participant group because those who attend such programs may already
be inclined to act positively toward the environment. This just highlights another challenge to accurate evaluations.

Evaluations, what they can offer in terms of increased understanding of what I have been calling the knowledge to action pathway, as well as actually conducting them face certain limiting challenges. My assessment from the literature is that the answer to the question “Does environmental education change environmental behaviors?” is: sometimes. The results depend on what one means by “environmental education,” when behavior is measured following a program, how it is measured, and on some yet to be discovered variables in the pathway. So, the answer is complicated.

Research on evaluation also is limited. In the same article mentioned above, Ardoin et al (2018) note two concerns. The first is that it is difficult to say for certain if the frequency at which the categories of outcomes that have been evaluated reflect what are the actual most common outcomes of programs or if the evaluative methods in the sampled studies are reflecting that which is easier for evaluators to define, measure, or fund. The second they note while calling for broader and holistic evaluations, saying that environmental education “is most often about relationships, processes, and providing opportunities for transformative experiences, rather than a singular focus on a specific outcome, as such, an outcome-oriented research design may distort perceptions of perceived success, while missing the overall richness of experience” (p. 14).

Further constraining our understanding of the impact of environmental education are the external factors influencing evaluation. Museums and science centers cite funding as one such external obstacle or limiting factor for evaluation development. Manpower and institutional energy and will are cited as well for being hurdles to face (Janes, 2009). Time and access to participants, particularly over longer time scales, present yet another difficulty to overcome in
order to evaluate outcomes, outputs, or impacts of informal education. Temporality of 
evaluations has a host of other concerns that stem from the very nature of the fuzzy lines one 
draws between an educational “event” and an outcome or impact, a fuzziness that the noisy 
environment, socially dependent, and contextually dependent nature of education is responsible 
for along with the inability to isolate that event from other experiences past or future on the 
individual which influences the “stickiness” of that event (e.g. Dierking et al, 2004).

Understanding how institutions are measuring their impact in environmental education or 
sustainability education has implications for sustainability transition efforts. While we may 
consider general education and environmental education to be central strategies for such a 
transition, we cannot say for certain how or why or even point to clean, distinct, indisputable 
impacts of educational activity.

As with other topics in the environmental education literature, there seems to be few 
studies that investigate evaluations from the perspective of the practitioners. A point could be 
made that the evaluations historically conducted do not reflect the perspectives of environmental 
education organization on how to measure success. Instead, echoing Ardoin et al (2018), the 
body of literature reflects a top-down perspective and the expectations of researchers. By asking 
the organizations in my study about their evaluative processes, we can better understand what 
they value most, what types of outcomes or impact they think their programming should have, 
and how they are trying to affect that outcome in their role within the field.

**Environmental education organizations**

So, where do organizations fit in? What are environmental education organizations 
actually doing? How are they translating all of the definitions and goals of environmental 
education into their organizational priorities? What are their own goals and motivations and how
are they making sense of the roles they play in the field of environmental education as well as in the community at large? What is their relationship to the contemporary global environmental goals (e.g. the Sustainable Development Goals), or to research on latest best practices or theories for turning knowledge to action (e.g. Ardoin, Schuh, & Khalil, 2016), or having long-term impact on participants (e.g. Winklerova, et al., 2018)? To what extent are practitioners’ intentions and practices assumed or ascribed within such frameworks rather than grounded in a reality supported by practitioner-focused research? What can we learn about the knowledge-to-action pathway from those actually executing it?

The objective of this project is to help answer, or begin to anyway, the questions listed above by investigating informal environmental education organizations, specifically ocean educators (see below for reasoning) from their own perspective. In the literature, environmental education is described as something that takes place in formal, non-formal, and informal educational settings. These three categories are not necessarily neat (e.g. Eshach, 2007), and individual defining characteristics sometimes seem to categorize a space in contrary manners. Without getting too deep into this debate, as it is not essential to this paper’s overall discussion, I propose that the categories be thought of as existing on a continuum, but with the understanding that an individual education site may have characteristics of several or all three. At one end of the continuum I place formal learning and at the other is informal. In between the two, but at no precise location, would fall non-formal learning. The differentiating characteristics of importance to this study’s case site selection are structure and voluntariness, with formal education being the most structured and least voluntary and informal being the least structured but most voluntary. As examples, the K-12 school classroom would be considered a formal setting and watching a documentary on the environment from your couch would be informal. Informal education has
been differentiated from formal education as being outside of any sort of organized group, such as the school system (Fein, Scott, & Tilbury, 2001). However, remembering that positions on the continuum are not so static, the familiar science center could be considered non-formal or informal depending on the degree to which the experiences they offer are structured or free-choice.

For this paper, the distinction between non-formal and informal is less important than between formal and the other two. In fact, in the literature, it is often seen that non-formal and informal are used rather interchangeably, whether there is universal acceptance of that is a discussion for another paper. The not formal setting is the context in which environmental education is discussed for this study as the conflicted identity of a singular environmental education definition or purpose is best highlighted and most likely to drift between “pure” education and more targeted education within this space.

Organizational identity and roles. To complicate the landscape of environmental education, we may be taking for granted that organizations such as informal science centers that provide educational materials on the environment have in mind goals that are educational in substance when it is sometimes the case that such organizations have purely recreational goals in mind. Hyson (2004) touches on this idea in his discussion of organizational identity among zoos. He adds that such institutions that were historically for entertainment purposes struggle to overcome this image amongst their visitors which prevents wholly successful conservation education efforts once or if those organizations attempt a shift towards new goals of education for conservation.

Participants in a study by McGinnis et al (2016), a group of scientists and a group of non-formal educators, revealed this phenomenon of ascribing roles to other groups. Each group
placed certain normative responsibilities for climate change education on the other which was not identified by that other group for itself- they “diffused” responsibility to the other group. Findings such as these help put the importance of the project at hand in context for me and hopefully for my readers as well. To circumvent any assumptions of the roles organizations are playing in the broader scheme of society by educating about environmental topics, it is important to question them directly.

An understanding of educators’ practices, which this project probes, will help uncover their beliefs behind their work and how they have made meaning of their roles (Taylor & Caldarelli, 2004). It may also, then, help establish where within the contexts set up previously, education and mobilization, they are identifying themselves and working. Knowing this could potentially direct further research efforts to incorporate more appropriate frameworks when investigating mechanisms behind adopting pro-environmental behavior and where or if knowledge truly has a central role. We may also be able to identify further variables to investigate by knowing what practitioners identify as being important to achieve desired action outcomes.

**Objectives**

The study described herein focuses on informal education centers in a particular branch of environmental education, ocean and coastal education, in order to answer the questions of how these institutions are approaching environmental education for coastal and ocean issues, particularly how or if they are motivating action. I will investigate how they interpret their roles in the field and in their communities in order to identify, through a comparison of the institutions’ intentions and activities, potential points of confusion, contradiction, or, in their
absence, discover a county-wide cohesive motivation and approach to coastal and ocean education.

Methods

Context: Ocean educators

“Understanding the ocean is essential to comprehending and protecting this planet on which we live” (National Marine Educators Association, n.d.).

The particular subfield of environmental education that will focus the project in this paper is ocean and coastal education. In Orange County, California, where this study was developed, the ocean and coastal environment is priceless to local residents and the tourism industry, and the beaches are exemplary of the stereotypical Californian lifestyle. Because this is such a critical environment to this region, ocean and coastal education is the branch of locally anchored and globally relevant environmental education that this study focuses on. So, by focusing on ocean education I can explore the broader questions of environmental education in a locally relevant expression.

Implications should still be relevant outside of Orange County and outside of this particular subfield of environmental education. As a subfield, ocean education still grapples with the same challenges and questions that its parent field does. While it may have some additional unique challenges, those are not the focus of this particular paper.

A potential limitation of narrowing the field of environmental education to the case of ocean and coastal education specifically is underscored by Taylor and Caldarelli (2004). Their investigation of the teaching beliefs of park educators suggested, among other things, that the particular outdoor learning environment they worked in had influence. They suggested that all non-formal settings need to be examined within their own context because “the possibility exists that each has its own unique conceptions of this practice” (Taylor & Caldarelli, 2004, p. 463).
However, while the context of ocean and coastal education may have some distinct influences, I posit that where my data exposes this will be recognizable and therefore not ascribed to the endeavor of environmental education as a whole.

**Defining Ocean and Coastal Education**

Ocean and coastal education, for the purposes of this paper, includes education pertaining to ocean ecosystems, animals, plant life, physical processes, and those things critical of coastal habitats such as estuaries and salt-water marshes.

**Case Selection**

There was a total of five different case site locations included in this study. To be included, each location had to be open to the general public, not only for reserved school-aged tours. This was desirable in order to focus on free-choice informal education facilities where the public could encounter the place of their own volition. Additionally, the sites had to include a brick-and-mortar facility with exhibits and displays pertaining to the coastal environments, plant, animal, or abiotic factors. This would ensure that visitors had come to the location to seek out information or some level of educational experience, but not necessarily with advanced planning.

To distinguish places from other models such as outdoor education (i.e. guided tours of tide pools), physical centers were chosen with the idea that such spaces and their content would have been intentionally curated; this would hopefully give insight to or be reflective of the interpretations the organizations’ leadership have of coastal education and educational objectives. These locations also tend to be where formal school programs come to for field trips, so the centers each have a general public and school-group foci.

Sites were selected from within Orange County, California. As it happened, sites in this study are located all across the county’s coastal cities. This characteristic was in a way self-
selected, as all such centers for coastal education were located in the coastal cities and I was unsuccessful when searching for such centers in the inland cities of Orange County.

A variety of organization sizes ranging from small three person teams to large “corporate” style partnerships and organizations were selected. The centers also fell along a spectrum of exhibit-heavy to those with few exhibits. These exhibits may have been passive, such as a display with text panels, to highly interactive. I discovered, as is the case with many things, that this line I was drawing, this typology I was trying to apply to these centers was a bit fuzzy in the real world. It was a lot like defining where the intertidal zone really begins or ends. It blends with other zones on either side and tapers off until eventually you arrive at another place but aren’t entirely sure when you got there. The centers included in the study were not solely one kind of center relying only on exhibits inside their visitor’s center. Even when the center, particularly to the public or those viewing the websites of some centers, seems to be the main attraction, each site incorporated set-ups or programming that left the center and the particular definitions of learning associated with it behind.

Selecting the above-described range of facility type was necessary to capture a fuller picture of coastal education in Orange County. Limiting or further restricting selection based on number of exhibits or organization size, for example, would have severely limited the number of eligible cases and likely only have reflected differences in how much funding an organization had rather than their role in the coastal education field in Orange County. Having a more inclusive size range will help this paper provide a broader, landscape view of coastal education centers in Orange County.
As a confidentiality measure, selected sites’ names and major identifying information has been anonymized and each organization will be identified generically for the remainder of this paper as Site 1, Site 2, Site 3, Site 4, and Site 5.

**Permission**

Letters of permission were obtained from authorized site representatives prior to conducting any research activities on site. These letters outlined the type of work I would be conducting on site, what resources both myself and the organization would provide, and when work was expected to be completed.

**Recruitment**

Initial participants were recruited via scripted email. Email addresses were listed on the organizations’ public websites.

Additional participants were arranged via a type of modified snowball sampling methods where the initial participant passed my contact information on to other employees who they thought I should talk to. Those potential participants then contacted me to arrange interviews. Potential participants were arranged by the site representative at Site 2 prior to my initial interview and not at my request. Upon my arrival at their site, interested employees were ready to be interviewed.

**Participants**

Participants were 18 years or older at the time of the interview and held executive and educational positions in their respective organizations. By talking to the educational and executive members who have a mile-high view of the organization’s goals and activities about how those goals were developed, the rationale behind them, how they set out to achieve those
goals, and what success looks like, the role they see the organization as having both in the field of ocean education and in their community can be parsed out.

As a confidentiality measure, participants’ names will not be used in this paper. When necessary, participants will be identified by their site number and position title.

**Interviews**

Semi-structured interviews were conducted. The interview guide covered the following broad topics: the organization's goals, the development process of those goals, and the rationale behind them; how the activity of the organization is divided up amongst common environmental education objectives; strategies and techniques to achieve objectives; defining and evaluating success; and roles they identify with. For a list of questions, see the Appendix.

Drafts of the interview guide were reviewed by my committee as well as my university’s campus-wide Environment Collaboration initiative’s administrating director.

Site 2’s authorized representative requested that the interview questions be sent several days ahead of time so that they would have some time to reflect on them. After consideration, I sent the representative the same list of topical areas as are in the paragraph above. My reasoning for this was the following: 1) having a clearer idea of the content of the interview would allow participants to make better-informed decisions regarding their consent to be interviewed, 2) since the questions and overall objective of the project focus on the organizational level, reflection on the topics by the leaders of the organization may offer the chance for fuller and richer answers and discussions, 3) this would help ensure that the participants had appropriate knowledge of the organization to answer the questions.
Apparatus

Interviews were recorded, with additional consent, on a digital audio recorder. Transcription was done using the software Express Scribe, and coding and analysis were done using Microsoft Word and Excel.

Analysis

Interviews were transcribed verbatim and each transcript was open coded. Based on emergent categories from the open coding process, more focused coding was conducted for each transcript. Emergent themes were then identified as answers to this study’s research question.

Results

Five informal ocean education centers were interviewed about their approaches to environmental education for coastal and ocean issues, particularly how or if they are motivating action and how they make sense of their roles in their communities and the field of environmental education.

Teaching Spaces

For several discussions to come in later section, a brief description of the facilities and location of each site will be beneficial.

Site 1’s center is a single building tucked into the surrounding bluffs with views of an estuary. Their building has one high-ceilinged, open space exhibit room, a hallway of offices and conference rooms, and a classroom facility.

Site 2 feels challenged by the size of their classroom space and overall size of their current facility, citing it as one of the factors that constrains their activities. Theirs is a two-story facility housing one classroom, a lab, a small conference room, an outdoor yard, and animal care facilities.
Site 3 has two exhibit spaces, and a courtyard in which exhibits are sometimes set up. This is the smallest center operated by the site’s parent organization, acquired just under three years ago (at the time of writing). The organization is in the fundraising stage of further developing the site. Their goal is to add an aquarium, a boat pavilion, and a laboratory space. The size of the existing space is identified as a constraint to activities.

Site 4 has a modest visitor center space with a single room lined with primarily taxidermy exhibitry accessible to guests though also shared with staff and researchers. The Site Manager noted the characteristics of the room limited its use as an educational space. For such reasons, and additional to be explained elsewhere, the exhibits prepared by the site are set up outdoors whenever there is a tour.

Site 5 is housed in several adjacent buildings, one of which is dedicated to classroom laboratories and hands-on aquarium tanks. They are located on a harbor, where their boats are docked. Space was considered a constraining factor for this center, particularly when accommodating large student groups.

**Audience**

**Centers aim to expand audience reach.** As far as visitor counts, all sites wish to reach more people with their programming, most have plans underway or current programs that help reach this goal. For others, such as Site 4, existing restrictions set down by the military base on which the center is located prevent exceeding a certain quota for the time being. However, they would like to max that quota out each month in an effort to provide support for either expanding the existing center or moving the visitor center to a different, more accessible area.

One unique restriction on audience type is seen at Site 4 where visitors must be U.S. Citizens in order to be granted access to the center since it is located on a military base.
Centers have broad target age range for audiences. Visitor ages vary, as each site is open to the public, there is no restriction for age and no age groups were specifically pointed out to me as targets.

The primary audience served is school groups. Each location is open to both public and reserved group tours, which will come as no surprise as this was built into the case selection criteria. All sites except Site 4 serve school groups on a large scale. A majority of school groups are from elementary grades, fewer are from middle school, and there is only an odd program here and there specifically for high schoolers.

Teaching Methods

Visitor experiences are primarily guided rather than free-choice. All locations offer guided tours, and only Site 1 provides the type of space and opportunity to allow for guests to explore the facility unguided. Four of the five locations provide audience-adapted programming which accounts for age of guests, special group tours (i.e. Veterans or Scouts), as well as public versus school group tours. Site 4 does not explicitly say that their tours can be adapted to fit their audience, however, as will be discussed below, the demographic make-up of visitors to this site were said not to vary much, which would make the need for adaptation minimal. Site 5 also provides programming, lectures, and workshops specifically for members of the general public which differ in content and approach from those programs designed for school tours.

Visitor inquiry and curiosity guide direction of programs. All except Site 4 share an emphasis on inquiry-based teaching with little to no true lecture time. They allow space for visitors to be curious and let that curiosity guide the direction of the activity and what they would learn from it.

I’m trying actually [to] drive our programs away from being- less informational to more engaging. And trying to make sure that our programs are helping to connect people with
this environment and engage with it, and explore, and more observations and to look at this place kind of like a scientist but also an explorer and, through that process, appreciate it and then want to protect it. You know a lot of passion is kind of lost on just information, you know? And so I want to try to pull things away from that age of just giving them all the information, all the need-to-knows about this place, and rather engaging them and letting them kind of get curious and then go seek out that information in other ways. (Site 1, Programs Coordinator).

We want kids to be hands on, we want them to be kind of problem solving and thinking we-[another employee] here’s actually developing a skull curriculum, where we have a set of skulls and we give them to the students and its, ‘what are they?’ you know, ‘why do you think it’s that way? Why do you think this particular skull has this adaptation?’, and so they’re going through kind of a detective mode to to learn about you know why skulls would be different and why they have certain adaptation, and or why they’re similar, because sea lions are very similar to canine skulls and why would that be?, an-but then why are dolphins have these big snouts, you know, so it’s kind of inquiry based learning because they start a question of ‘what is this?’ and then ‘why is it?’ (Site 2, Director of Education).

We do, as part of the boat tour when we go out into the the bay, we point out where you see netting, where you see boats, where you see land, and explain the history, again that’s kind of paying homage to the original idea that we were a historical museum. How did Newport-how how’d the peninsula get here? How did the bay get here? Because it’s all man made. What does that mean? [Researcher: mhm] How has that changed the ecology? How has that changed the wetlands here? When we see all this netting, what happens to it when it decays? What you know we kind of go through all of those kinds of conversations. (Site 3, Director of Education).

“So, we want learning to be fun. We want it to be inquiry base. We’re not going to stand up and-our approach is not to lecture. It is to have them figure it out for themselves.” (Site 5, Director of Public Programs).

Visitor center experiences are supplemented by outdoor exhibits and experiential activities. With exception to Site 2, each site incorporates an out-of-center outdoor element into, minimally, their school group tours. This element ranges from trail walks, to setting exhibits up along a trail, from walking out to an exhibit on a pier, to taking visitors out on a boat. Site 2 has a portion of its facility that is outdoors, where animals are housed, but it is more of a viewing space and the being outdoors is not the focus.
All sites incorporate some experiential learning into their activities. Specific activities vary from citizen science programs that allow visitors to contribute to the centers’ research objectives by collecting data themselves, to hands-on laboratory learning, to mock animal rescues. The goal being to put the learner into a mindset where they take-on the persona of a scientist, a rescuer, etc., to see what they do, how they do it, and along the way they learn about the environment as well as the ins and outs of conservation or research.

This was a rather interesting, though not entirely unexpected result considering the emphasis on experiential learning in the environmental education field. However, because I had explicitly selected sites on the basis of having visitor center spaces with exhibits and such that the public could come to, the fact that all sites then took visitors outside indicates that more passive learning experiences may not be the norm for the field.

**Indirectly approaching politicized topics prevents confrontation and improves receptivity.** Across the five sites, an array of teaching strategies is used. Lecture, hands-on, participation, exhibits, and combinations of these. Within those, some participants expanded on how certain topics are specifically addressed. For example, for a topic such as climate change, the discussion or transmission of information is more oblique to avoid confrontations with guests or to align with organizational restrictions on behavior or topics discussed by staff due to their political nature. The Director of Education at Site 3 describes their approach to climate change as implicit, with the observable effects separated from causes:

But it may be touching on the specific aspects of how the ocean is becoming more acidic and less talking about climate change so that if somebody doesn’t believe in climate change or doesn’t believe that climate change has you know humans are influencing it in anyway you can still have that scientific conversation with them about how the ocean is becoming more acidic and let’s go do some [Researcher: mhm] experiments ourselves and they may not make that connection to climate change. And we we feel that’s that’s good, ‘cause we are, without them becoming closed off to that conversation, willing to listen to some of the science. (Site 3, Director of Education)
They believe this to be a more effective strategy for guests to accept the information being offered, but also it serves to protect staff from confrontations with the guests:

When you get into that political -where people th-think that you know it has nothing to do with humans and kind of stuff along those lines it they they just don’t wanna they don’t wanna listen, they just want to hear their own opinion. So, we don’t wanna put our staff into that kind of uncomfortable situation. (Site 3, Director of Education).

This was something I was interested in hearing about and actually expected to hear more of; however, this was the only site that stated it so plainly. The nature of how Site 3’s visitors find them, that they are perhaps less self-selected than visitors to other sites to be “pro-environment” or “believers” in climate change, is one reason listed for the purpose of this need to be sure confrontations would be avoided.

**Program Content**

Content emphasizes locally relevant topics and leverages them for understanding of global issues. Program content includes basic information about local environment and ecosystems as well as broader issues such as climate change, plastics, or species loss. This blend is typical across the sites, with variation in emphasis. The content of programs for all sites, except Site 4, also has a slight lean towards that which is required by CA State Standards for science and, in some cases, history. Likewise, age of visitors determines how in depth they will go on a topic as well as if particular elements will be included or not.

Overall, the greatest emphasis is placed on the local over regional or global- i.e. local coastal problems, local wildlife, local ecosystems, local landscape, local history. The regional and global issues, such as climate change, fishing industry, pollution, or species loss are brought into programming primarily when their impacts can be seen in the local ecosystem, or, reversed, how what is happening at the local scale has rippling, global effects whether negative or positive.
The local-regional-global connection is highlighted by the “one world, one ocean”, or “two coasts, one ocean” ocean literacy concept. This idea of one ocean connecting the world is also broken down to smaller levels in which the sites hope to first connect participants to their local space and then have them understand how what they do at that level will have global effects. While the global connection is present, the emphasis remains on the local level observations, impacts, and solutions.

Pollution is a prominent topic to which program content refers. All participants brought up the topic of pollution when describing the content of their programs and how they connect to broader topics. All sites pinpoint plastics and plastic pollution specifically. Sites want visitors to understand not only the extent of the pollution problem but also how the pollution interacts and interferes with the natural processes and environment on global and local scales. As with other content, sites want visitors to feel personally connected to and involved in the pollution problem because “if you bring it back to them and how ocean pollution impacts their daily lives, they’re gonna care a lot more” (Site 5, Director of Public Programs).

Included in their discussions of the causes and impacts of pollution, are lessons on waste reducing behaviors. A program at Site 3 serves to highlight all of these ideas together. They designed a game for their younger student visitors where a fish tank is filled with water, plastic fish (rather than real fish), and pieces of trash that would be familiar to their age group like squeezable yogurts, or wrappers from gummies. The point of the game is to personalize the issue (i.e. recognizable types of trash), help them visualize the impact (fish swimming in trash soup), then have the children pick up the trash out of the tank to save the fish. In doing this, the organization hopes that the children will adopt this new behavior they have learned when they leave the center and continue picking up trash outside.
Program content includes discussions of climate change, but not always directly.

Another broader issue that programming connects to is climate change. However, the connection is oblique rather than direct and obvious at Sites 3 and 4. Site 3 does include content instructing visitors on humans’ impact, but they try to keep the conversations about causes of climate change separate from the impacts, for reasons described already. Essentially, they try to trick visitors into learning about climate change by coming at it indirectly and not calling it climate change because more visitors will then be open to the information and gain the knowledge without putting up any mental walls at the phrase “climate change”. The other sites do explicitly include climate change in their programs’ content. For example, Site 1 does not cater to potential contrarians, and approaches their programs’ curriculum development with the assumption that visitors “believe” in climate change and so spend less time going over causes and more time on the impacts and observable changes to the local and regional environments. The Program Coordinator had the following to say about their content selection for this topic:

[I]t’s almost factual that climate change is is a scientifically supported theory and that the scientific community recognizes it as being mostly human-human driven. And that it’s that climate change is real and-so kind of, it’s we don’t have to spend any extra time improving that, we’re just going from the foundation that it is real, it is human driven, and you know these are the effects that can be showing up because of it. (Site 1, Program Coordinator).

Site 2 integrates climate change into conversations about topics related to the region as well. For example, they talk about how climate change can exacerbate the negative impacts of the fishing industry on local marine animals and their ecosystems. So, they talk less about climate change as an isolated phenomenon and bring it into their programming by talking about its relationship with other natural and man-made phenomena. They do discuss causes, impacts, and potential solutions in their programs as well.
Advocacy and targeted behavior changes are promoted in centers’ programs. Some programming provided by Sites 2, 3, and 5 takes on a bit of an advocacy element, some being more intentional and explicit than the others. Site 2 packages all of their lessons with a targeted conservation message which often includes a behavioral change. Site 3 programs instruct visitors on better purchasing behavior, particularly with the intention of reducing pollution, they also describe their programming as having an “eco-friendly” theme woven through. Site 5 runs a program about local coastal access rights, including why they are important and what sort of challenges they bring up. Site 5 makes a point about their programming, saying that, while they try to implement behavioral changes and other solutions, they are weary of overwhelming their visitors.

Individual programs are bridged by broader, overarching themes. The methods behind, individuals’ roles in, and the importance of habitat restoration, ocean conservation, and broad environmental stewardship are some thematic bridges between the different content and programs the sites teach in their programming.

Missions, Goals, & Outcomes

Educational Goals.

Centers have the same educational objectives, but emphasis varies. Each participant agrees that their respective sites’ educational programming seeks to raise awareness, increase understanding, change behaviors, and promote some degree of advocacy or greater action. There is variation, though, in the degree to which each site emphasizes one or some of those objectives over the others, as well as in the outlining of such outcomes as specific educational goals which programming achieves. By the latter I mean that, while they know what types of outcomes their programs are ultimately geared towards, there is not necessarily a top down strategy organizing
or delineating efforts along those objectives. Another conceptualization of objectives is described as having goals in which those four objectives are so integrated and that because each broader educational goal is reached through achieving the others, they feel any one objective is not emphasized over the other.

**Learning outcomes are co-occurring and strongly connected.** When asked whether the organizations’ learning outcomes are conservation based, education based, based on community interaction, or something else, responses ranged from “Kind of all of the above” and “all encompassing” (Site 1) to “they all intersect” (Site 2, Director of Education) and “All of the above” (Site 2, Executive Director), to “a little bit of all three of those” (Site 3, Director of Education), to “I mean it could be a little bit of all of that” (Site 4), to Site 5’s expansion: “our four main goals with the [site name] is conservation, research, education, and excellence”. In summary, learning outcome types are all tied together. There are not only conservation outcomes, or only educational outcomes, or only community relationship outcomes. Some include more, but in the end all of them are interconnected and co-occurring.

When prompted by this question, the Manager at Site 4 reflected, “I guess I mean it could be a little bit of all of that. But, what’s the primary? You know, are we just trying to educate people? I mean I think there’s- on the surface, you could say, yeah we’re just trying to educate people, but there’s a goal be-behind educating people, right?” This reflection on primary and secondary goals and ulterior motives of environmental education indicates to me that researchers like myself are not the only ones philosophizing about the real purpose(s) of environmental education in Orange County.

**Programming Goals.** The educational goals of the organizations are meant to be supported by their programming.
Establishing an emotional connection between visitors and coastal environments and animals is key to action outcomes. It is both a goal and a strategy. One objective of the programming of these sites that is listed in addition to, though in support of or at times supported by the four listed above is developing emotional connections, concern, or even passion, towards the environment and animals impacted. For most of the sites, this is key to getting visitors to care enough to take the action being promoted by the programming. Several of the sites actually specifically hope visitors will take that connection further and have careers in some related field like oceanography, or environmental education, or be a scientist. So, emotional connection serves both as a strategy to achieve their broader goals and as a goal in and of itself.

Daily, individual behaviors are primary action outcome goals of programs. The types of actions sought as outcomes from the programming fall primarily into daily, individual behavior changes. Others also promote more active engagement with the issues. For example, Site 2 has students in one of their programs conduct a project that requires real world actions. Students identify organizations in their local community with irresponsible behaviors that, in some way, impact the coastal and ocean environments negatively. They then write an essay to persuade the business or organization that they should stop a bad behavior or start a good one. To fulfill the requirements of the program, the essay must also be sent to the business in question. In completing this project, students not only meet the writing requirements of their school, but they are also learning about “campaigning for the earth, and being advocates and getting out into the community and actually taking action” (Site 2, Director of Education).

The sites also hope that and rely on visitors taking the information and behavior they have learned from their visit and sharing it with their friends and family and becoming educators themselves, in a way.
**Bottom Line Mission.** The mission of the informal education centers serves as the ultimate goal around which all of the organization’s other sub-goals and objectives are developed. There is variation across all five sites as to the overall, bottom line mission of the organizations, regardless of the similarities across their educational goals. The missions fell fairly neatly into two broad categories, though with subtle differences within the categories. I’ll allow the participants’ own words to illustrate.

**Land and/or species conservation.** Site 1 describes their mission as protecting the reserve they are located on: “You know, I think overall, a lot of our message for the tours is to come out and learn about what an estuary wetland is, why it’s important to be protected, and what they can do to help protect it. That’s kind of like, you know if we had to pick like a-a general theme for anything, that’s kind of your your main priority.”

The ultimate mission of Site 2, as described by the Executive Director is conservation of species, and all other parts of the mission are secondary. He says, “You know our main mission is the rescue and rehabilitation of marine mammals and then education, outreach, community involvement. [pause] Then of course there’s the fundraising, but the animals really start [it]. In the education we use the animals as the ambassadors of the education program, or the reason why we should conserve more.”

The Director of Operations for Site 3 describes their mission in terms slightly more specific than the way the Director of Education (in the next section) does: “Our mission with the [Parent Organization’s Name] in general is early learning, stem proficiency, environmental stewardship, and healthy living. Because we’re [this particular Site] located in an environment that you can touch [Researcher: mhm] and experience, that’s where environmental stewardship
became a main focus here. At our other locations, they focus on STEM, it’s it’s more mechanical sciences. We’re environmental sciences here.”

At Site 4, the bottom-line mission also centers around preventing species loss and preserving bird populations. The following two statements illustrate this: “I mean the primary things that I’m supposed to do is take care of the birds, so that’s how I measure my success, is are the bird populations are the two endangered bird populations going up or going down, or flatlining, you know, [Researcher: mhm] staying even.” “[E]ssentially the root reason for refuges existing is the same for the last hundred and fifteen years is to prevent the loss of species in the wild.”

**Inspiration, connection, and action.** The Director of Education for Site 2 puts their bottom-line mission slightly differently than the Executive Director, saying, “[...] when people hear the stories, they feel very connected and compassionate to the animals and they are more likely to then be receptive and adopt conservation behavior, so that’s our focus is really to connect people to animals to achieve that.”

The Director of Education for Site 3 provided me with their organization’s tag line to begin answering this question. I have not included that section of her explanation in an effort to maintain the organization’s anonymity. “We want to- we have- our tag line is [Removed]. So, we want to inspire all of our guests to do something about it, learn more, be interested, be intrigued, just inspire them in some way. If they’ve been inspired, they’re more likely to take it to the next step. We want them to walk away learning something, that’s that educate, and then the impact where we really want them to turn around and do something about it, whether it’s at the personal level or a larger scale.”
For Site 5, the overall mission is to inspire kids to learn. Just as with Site 3, the Director of Public Programs quoted their organization’s mission in this answer, and again I have removed it to maintain anonymity. “Our mission is [Removed]. So, education has always been a core principle of the [Site], and those three other core principles are fairly new to us.”

This variation in bottom line missions makes the relative similarity amongst the centers’ education-specific goals somewhat surprising.

**Evaluation of Success**

The evaluation framework for all of the sites can be broken up into two categories.

**Formal program evaluations are conducted for grant-funded programs but are not the norm.** The first category applies to grant-funded school programs. When a site has a more formalized evaluation of knowledge acquisition or program impact, it is for programming that has grant funding. The funding sources require some sort of evaluation as a condition of funding. These evaluations take the form of pre-tests and post-tests, primarily, and on one occasion specifically include teacher evaluation and feedback of the program (Site 3, Director of Education). The post-tests are most often administered immediately at the end of the program while students are still on-site or within a week or two after students leave, in which case teachers would administer the post-test in their own classrooms and send the results back to the respective organization.

**Qualitative, visitor experience feedback is the primary evaluation method.** The second category of evaluation is the less formalized, experience-based evaluation. This is the more common variety amongst these five sites. The organizations want to be able to gauge whether visitors are having a positive experience participating in their respective programming. Specifically, organizations want visitors to have fun. Experience-based evaluations take the form
of surveys offered to visitors and, in the case of field trip groups, sometimes to the chaperones as well. Some sites also, in lieu of a survey, try to gauge experience in situ by listening to conversations around the center or watching reactions of guests. These experience surveys provide feedback to instructors or directors that can then be used to make modifications in the future that would improve the experience. For example, Site 4 reorganized the structure of their tour after several rounds of post-tour surveys indicated that guests would prefer to experience the video element of the tour earlier to give more background on the rest of the visit.

**Evaluations are in-situ and short term.** In each case, the evaluations emphasize short-term timelines and do not follow up with guests to measure longer-term impact on, say, behavior, as one example. Regarding the public facing programming at Site 5, the workshops and lectures designed for the community to attend separate from the tours, the impact and follow-through is hard to evaluate and so they do not know if they are reaching the goals they set out to, such as raising awareness or changing behavior. Not knowing with much certainty the success of a particular program, making adjustments to the content or delivery is aimless.

**Conservation minded centers track species’ status.** One additional category that applies only to those site, 2 and 4, that have animal conservation as their goals is species status. For example, counts of animals and animal health are used as measures of success, in part, for these organizations.

**Challenges & Constraints**

This section will describe the challenges these sites identify to conducting their activities or achieving their missions.

**Human and social capital, and content standards constrain curriculum development.** Among nearly all sites, curriculum development and delivery are contingent upon
the personal knowledge of team members which has implications for consistency and quality of programs overtime. In the case of Site 4, exhibits depend to a degree on the knowledge of the team member delivering the information for a particular exhibit. Higher quality presentations are given by team members with more extensive knowledge on the topic. In the history of the organization, some exhibits have been removed from rotation and brought back once a new volunteer or staff member started who had the appropriate knowledge.

Similarly, at Site 1, programs’ references to climate change are relatively new because the current Programs Coordinator added the content to reflect her interests and the topics she believes to be important.

At Site 3, this challenge plays out at a different scale. Because this site is still early in its lifespan and because the ocean educator world is new to the organization that owns it, an organization who operates several other more engineering and broader STEM based science centers, they rely on strategic partnerships with local science and education organizations as well as researchers to develop a portion of their curriculum content and activities. The site values these relationships and the collaborative atmosphere amongst similar organizations, but the development of their programming is dependent on and therefore constrained by the ability to form those relationship.

As a site that incorporates local history and general maritime history into its educational goals, staff at Site 5 sometimes must put extra effort into curriculum development to ensure this overlap is achieved. This task was described as being “definitely a bit of a challenge sometimes” by their Director of Public Programs.
Space and geographic location inhibit visitor numbers. Getting and maintaining access to visitors is crucial for these organizations to achieve their educational goals and broader missions. However, the location and size of the facility directly or indirectly limits visitor access. Site 2 emphasizes the size of their facility as limiting to their operations. Their center described in a section above, has a single dedicated classroom space and a small conference/lunch room that serves as a second when needed.

We also have other hurdles to all of that beside money, which is still tied in with money, is space. We have one classroom [laughs] [Researcher: yeah] you know. And sometimes we can use this for dinky groups [referring to the lunch conference room the interview took place in] but we’re really constrained by the fact that we only have one classroom and we’re trying to address that soon [Researcher: mmhm] where we’re looking at raising money to kind of extend this level [the second floor] out back toward the hill [Researcher: ok] so that we can [have] another classroom […]. (Site 2, Director of Education).

Facility size, specifically, challenges Site 5. As they’ve increased their visitor numbers over time, but particularly when large school groups visit, the space constraint is felt more strongly, forcing the team members to be creative with group rotation schedules and how they use the available classroom and lab spaces.

To reiterate the description of the visitor center space for Site 4, there is not much space inside the center itself for meaningful educational activities. To address this challenge, exhibits are set up outside the center in preparation for visitors and taken down after each tour.

The geographic location negatively impacts visitor numbers for several sites as well. The physical, geographic location of Site 3 is cited as significantly impacting their visitor numbers. They share a location with a strip of tourist-centered activities and shops (the land is owned by the Site’s for-profit arm) in an area where parking and traffic can be challenging. This means that aside from school groups, a large portion of their visitors are tourists who walked by the facility
and were curious about what was offered. Paired with being in the early stages of their
development and boasting only two exhibition spaces, they are not yet, in their words, a
“destination” that draws in visitors from further away than right outside their doors.

To frame this discussion for Site 4, note that this visitor center is located within the
boundaries of a military base. As such, they operate under strict security guidelines set by the
respective military branch. These restrictions include visitor eligibility requirements, as well as
visitor access to a majority of the natural features of the property. Potential visitors of this site
submit personal information in advance to the organization so that the military may run some
degree of background check. Visitors must also be U.S. citizens. Additionally, tour attendance is
capped at about 50 visitors per tour and one tour per month, partly for manageability of
background checks as well as for staff-visitor ratio purposes, but also so that there are not large
numbers of people walking around or possibly being lost track of on a military base.

Understandably, many potential visitors are turned away or, as with some school
teachers, decide not to pursue the visit because they choose not to inquire after their students’
and chaperones’ citizenship statuses. The current manager of this location tracks the number of
inquirers lost and applicants denied as part of a developing plan to potentially build a new center
in a different location accessible to anybody. As it stands now, this Site’s messaging and
programming is only able to be offered to about 600 visitors a year. Also, on the topic of
audience reach, for those who do go through the effort of applying for access and who are
accepted, demographics vary little. Only a small portion of the diverse surrounding area is being
exposed to the experience being provided at this site.

Across the sites, the location issue is neatly summarized by the characterization of the
centers as “hidden gems” (Site 5, Director of Public Programs). This phrase was reported to Site
5 specifically in public surveys indicating they have low visibility in the greater community, but the phrase could easily be used to describe the sites’ shared challenge.

**Public expectations and attitudes do not always align with centers’ operations and strategies.** When the public doesn’t understand all angles of what the organization is addressing and therefore thinks that the organization is failing at their mission, it raises another challenge to be managed.

For example, Site 2 notes the public’s expectations and misunderstanding of problems facing the animals and what possible solutions are as a challenge for the organization’s operations, even outside of educational programming and within their animal rescues and rehabilitations. The following excerpt illustrates:

> [B]ut the problem is if they get close to the animals when the mom is eh has pupped, they can scare the mom back into the water and that pup gets abandoned. And what’s even worse is that then all of these people are watching these animals, seeing moms with pups but then there’s that one pup that doesn’t have a mom that’s just sitting there starving. And so then they are asking us, you know, “Why aren’t you rescuing that pup?” And it’s because if we go down there, all the other mothers will abandon their pups in our effort to do that. So, you know we -we’re looking at the greater good there. (Site 2, Director of Education).

In order to fulfil their mission, the organization must disregard the public’s expectations.

In regard to obstacles to achieving programmatic goals, Site 4 acknowledges that the entire field of environmental education struggles with getting people to care, getting people to feel like they can make a difference, and achieving behavioral change: “‘Cause some people [are] like, ‘Oh well, there’s nothing I can do.’ But, yeah there is something you can do, you’re not perfect, but there’s something you can do.” The center tries to overcome the visitors’ attitudes and perspectives on environmental issues and actions by trying to change them through their programming, but they are a primary obstacle.
When Site 5 opened their facility up to daily public tours, rather than being restricted to private or school tours, several novel constraining factors revealed themselves. Some are identified more along the lines of a learning curve, adapting to their new audience, such as developing tour programming that fits well with groups diverse in age and interest. Others are in meeting expectations the general public had and has of their tour experience. For example, the nature of their facility requires a docent to guide visitors through their visit whereas visitors expected to be able to roam around.

So, in 2015, we opened to the public seven day a week, but didn’t necessarily provide the public with what they were wanting. So, people wanted to be able to come and explore [Researcher: mhm], and learn, but we didn’t plan for them to want to do those things. And so we’ve had to really adapt to provide structure, because our programs are so structured, we have to provide-like we can just have public roaming around, right? [Researcher: Right] Like, that’s not really how we’re designed, we don’t have exhibitry on our tanks that would allow people to run through it like an aquarium. So, finding that balance between giving the public what they need and want, while still keeping the integrity of how we teach not just for school programs but also for the public. (Site 5, Director of Public Programs).

**Organizational structure limits quality of programming and program delivery.** As the educational department at Site 1 is evolving and the Program Coordinator is wanting to adapt content and teaching strategies, the fact that the volunteers who employ older techniques are the ones training the new volunteers, and that the education department does not currently have direct oversight in that area, is proving challenging to getting a team of volunteers all using the new strategies. The organization’s future directions depend on volunteer involvement, but the structure of the organization makes the training of those volunteers a challenge to those future goals. In her own words:

I think the other challenge that I’ve had, or the other limitation, is just in the training of our volunteer naturalists that help provide the programs. They have a ton of knowledge and they’re really intelligent people, but helping them to learn how to be better teachers with all that knowledge is sometimes more of a challenge, and trying to bring them away from that kind of older mentality of information [Researcher: mhm] kind of just being the
the sage on the stage [laughs] as it goes, and trying to get them to step off of that spotlight and help guide their audience through the experience more instead of telling them what they should be experiencing. That-that is always a challenge. And I think the-the solution for that is going to be in how we provide our training to our volunteers. But the ones organizing those volunteer trainings are some of the volunteers [both laugh] it’s getting a little bit more buy-in from the people that are providing those trainings of how that needs to change. And then maybe even going around that and providing my own trainings specific to the programs mm and helping to train those specific volunteers in in those different teaching methods. (Site 1, Program Coordinator)

There is only one paid staff member accounted for by the organization at Site 4 and therefore volunteers are critical for the implementation of programming and to an extent site operations. While the current team of volunteers is implied to be very dedicated to the site and to environmental issues in general, the accumulation of new volunteers proves tricky. Potential volunteers may have been exposed to the site through a tour and, inspired by their experience, now want to volunteer. The next step, for the site manager is to really get to the bottom of what they want to do considering the high level of involvement required of volunteers. As it takes a lot of investment of time, resources, and energy for the single manager to train incoming volunteers, it is important to determine whether they are looking for a true commitment, or if they would actually like to help in other, less involved ways.

**Funding constrains quality of overall operation.** The amount and type of funding available to the centers has indiscriminate effects across their operations.

**Grant funding.** For several sites, Site 1, 2, 3, and 5, the positions of those responsible for writing and conducting the educational programming are dependent on grant funding.

Mhmm. Money [laughs] money’s definitely the top. Having funding because whether or not we do certain programs will sometimes depend completely on if we have the money for it. [...] it takes about $50,000 to run 110 classes because that money also covers busing, which is the biggest cost in that program. You don’t want the teachers to have to raise that money [Researcher: mhm] and so they they’ll rent a bus but then we reimburse them for the cost of the busing. (Site 2, Director of Education)
You know we run a lot off of grant funding. My whole position is grant funded pretty much, so you know without adequate funding I think it’s harder to provide you know some of the-the biggest goals and dreams and things like that, because you’re just limited by what you can provide. (Site 1, Programs Coordinator).

While the organization has a “long list” of goals, reaching them depends on having the funding to support their efforts. While the Programs Coordinator, cited above, indicates that they do not quite feel restricted or that they do not have enough money, in order to maintain the positions and the activities, the funding must also be maintained; the level of funds in the organization’s budget acts as a limiting factor to their work. This is the case, also, for the citizen science program at Site 3 which is cited as their most successful program.

Grant funding is also a limiting factor when it comes to program evaluations. As was discussed above, the only sites that carry out any pre- and post-test evaluations to gauge impact are site’s whose grant funding supports and requires such evaluations. Furthermore, funding from grants is what allows Sites 2 and 3 to provide programming to Title I schools. Without funding to help the centers cover costs of bussing, which is the primary expense of field trips, such schools would likely not have the funds to give their students the opportunity to visit these sites. This would, in turn, lower visitor numbers for those sites.

**Development and expansion.** In the realm of program and curriculum development, the cost of obtaining access to scientific journals and trustworthy sources forces Site 3’s team of fact checkers to use other online sources.

We do a lot of fact checking in various resources as much as possible we try and verify from several different studies in peer-reviewed journals, it’s not—we don’t always have access to peer-reviewed journals in part because [we’re not] a university so we don’t [laughs] we don’t already shell out all that kind of sometimes thousands of dollars. So, we have to rely what have access to, which I mean the internet is you know a godsend [laughs] in today’s day and age. (Site 3, Director of Education).
While funding certainly plays a role in the maintenance of current operations, those sites looking to expand (most sites) must also raise funds to do so. The Director of Education at Site 2 relates that obstacle to a broader constraint on reaching objectives and that they have to raise money to extend their facility. Site 3, which is still developing, must reach certain thresholds for fundraising in order to meet their programming goals as well:

So, the first thing is we develop our site. [Researcher: mhm] So, we develop what we’re gonna do, and you do renderings, and then the next is the capital campaign [Researcher: right], and then so it’s the financial end of it. And so, as you reach those financial goals, you can reach your site goals. (Site 3, Director of Operations).

The comparison of challenges and constraints across the range of this particular type of informal ocean education facility indicates more similarities than unique challenges. Though the obstacles play out in sometimes different ways, the root challenges are the same.

**Roles & Responsibilities**

Participants were asked questions about what role they felt their organizations play in their communities and in the field of ocean education or of environmental education, as well as whether they feel they play a part in transitioning Orange County into being more environmentally friendly or sustainable. They were also asked about their vision for their organization, the answers to which sometimes took the form of a vision of what roles they could play in the future.

**Centers identify themselves as being resources to the field and for the community at large.** Sites 1, 2, and 5 each identify their organizations as a community and/or county resource. The Program Coordinator from Site 1 describes their organization as a resource for not only information, but also inspiration, and envisions taking on the role of leader in growing community involvement and in [estuary] science.
I would like to still think that, you know, our mission is still to-to be that sort of source of information, and knowledge, and inspiration to get people to come down and be involved [...] (Site 1, Programs Coordinator).

Site 2 offers their services as a resource to schools and scouting groups by providing programs that overlap with the other groups’ curriculum needs. The Director of Education provided the example that follows:

What are they learning at K through 2? Well, at K through 2 they’re earning about adaptations they’re about senses, so we’re gonna talk about how these animals, marine mammal, have the same but also different senses than we do, and we then would do not only do they learn about that and compare and contrast, but then they get to experience it through different a-uh-activities.

The Executive Director of Site 2 describes their role as a community resource on a deeper level:

[W]e’re teaching about conservation and how important it is, so I would say everybody at least in Laguna Beach, certainly does benefit from us being here and doing what we are doing, really e-everybody on the coastal towns. And then, you know, our education programs go for less fortunate or less financially stable schools and we bring'em all down here to Laguna for no cost and then it's wonderful to be able to do that and bring the kids in and see the beach, teach 'em about the beach, teach 'em about the environment, teach 'em even inland they have an effect on the environment. (Site 2, Executive Director).

Specifically, Site 5 provides expert knowledge in the fields of ocean science and education. In the future they hope to also be a resource to research universities.

And so that really prompted us to look at you know what we are doing and what our messaging is, and we want to be a leader, and we think we are a leader, in education and community- a community resource, and a resource for universities to have researchers here. (Site 5, Director of Public Programs).

There are many ways in which a community could leverage or partner with the services of informal educators. These three centers have internalized that role and present several variations of the relationship.

Centers aspire to be role-models for other centers in their field. Within the field of informal environmental education and conservation education, a common theme among the sites
in this study is the identification as and aspiration to be leaders. A comparison of the centers’ responses reveals several different embodiments of leadership, but leadership nonetheless.

For Sites 1, 3, and 5 focus their leadership in the education side of their work. Sites 1 and 3, aspire to lead their field in education, the latter taking this role a bit further and hoping to be a role-model facilitator of ocean education efforts by convening local experts to share expertise in content and strategies.

The variance in bottom line missions is realized, also, in the more specialized leadership visions of Sites 2 and 4. The Executive Director of Site 2 told me about a partnership that was in development so the two organizations (I will not name the second in this paper) can “can start [their] own conservation medical directive [t]here which is instead of just looking at the animal and what's wrong with the animal, conservation medicine goes into what's wrong with the animal, what's wrong with the environment, and how does it relate to human health.” This partnership to establish a new directive and implement a rather new line of conservation thinking furthers the site’s position as a leader in the field.

Site 4 describes a more showcase role, that they are meant to “talk about and show what we’re doing at a federal level”. By the end of the response to my question, the role-model idea becomes more apparent, and, in order to maintain that status, they must also fulfill their role as protector.

So, yeah, I mean our role is just relative to everybody else that has almost the same thing is we have a very unique place that’s about as pristine as it can get for So Cal, for Orange County and so our role is just to show them what what that what a pristine might look like versus elsewhere. So, like two restoration projects are using us as a reference for what they should look like when they’re done, yeah, […] So, I guess that’s our role, is to protect. (Site 4, Site Manager).

The Site Manager from Site 4 seems to struggle a bit with two conflicting ideas- of getting more visitors to be able to experience the space, and protecting the pristine environment- it seems that,
perhaps, the role of this site could be to model not just a pristine conserved space but also sustainable visitation that doesn’t impact the endangered species or the preserved space.

**Centers fulfill an incubatory role.** More than providing expert knowledge or modeling excellent teaching methods or conservation efforts, there is a sense that these centers are cultivating something and providing a space for development.

Site 2 considers themselves a motivator of action, an awareness raiser in their community, and a connector to nature in their field among other educators. In that way, they are initiators laying the foundation for environmental action.

A few organizations identify as action-initiators over a longer timeline. Through their programming, Sites 2 and 3 want to help students find a passion for science and oceans and develop it into a career in a related field like oceanography. In the transcript excerpts below, you can get a sense for the way these two particular sites share this aspiration but with varying degrees of intentionality.

And we’re hoping that maybe one out of a thousand or one out of a hundred people, or kids that we touch or go through our program all of a sudden wants to stay in the sciences and wants to stay with that. Like we touch that nerve and they get-and we want to make them excited about it and just kinda develop those future leaders in the fields [Researcher: mhm], you know? (Site 3, Director of Operations).

I would I would like to see us tackle bringing in junior high and high school students and building kind of a career-oriented program where we could have them be more hands on within our facility, where they could learn about the animals, their physiology, their ecology and all that, learn about research where they would come in and participate in our surveys, [Researcher: mhm] they would participate in behavioral research, they might participate in veterinary things. (Site 2, Director of Education).

Being rather new, Site 3 has yet to define for themselves their role in the field of environmental education and ocean education, but the sense is that their role would be focused around education and recreation.
Summary

Table 1. Summary of Results

<table>
<thead>
<tr>
<th>Audience</th>
<th>Site 1</th>
<th>Site 2</th>
<th>Site 3</th>
<th>Site 4</th>
<th>Site 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Available to walk-in visitors.</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>N</td>
<td>Y</td>
</tr>
<tr>
<td>Open to reserved tours.</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>Serves school groups.</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>N (Rarely)</td>
<td>Y</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Teaching Methods</th>
<th>Site 1</th>
<th>Site 2</th>
<th>Site 3</th>
<th>Site 4</th>
<th>Site 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primarily offers guided tour/experience.</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>Offers free-choice “wandering”.</td>
<td>Y</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
</tr>
<tr>
<td>Program content is adapted to visitor group needs/interests.</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y/N</td>
<td>Y</td>
</tr>
<tr>
<td>Learning is experiential.</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>Visit incorporates outdoor element.</td>
<td>Y</td>
<td>N</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>Politicized program content is approached indirectly. (climate change).</td>
<td>N</td>
<td>N</td>
<td>Y</td>
<td>Y</td>
<td>N</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Program Content</th>
<th>Site 1</th>
<th>Site 2</th>
<th>Site 3</th>
<th>Site 4</th>
<th>Site 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Program content connects locally grounded topics to global issues.</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>Program content supports specific CA state standards.</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>N</td>
<td>Y</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Missions, Goals, &amp; Outcomes</th>
<th>Site 1</th>
<th>Site 2</th>
<th>Site 3</th>
<th>Site 4</th>
<th>Site 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Programs promote specific advocacy and very specific behavior changes.</td>
<td>N</td>
<td>Y</td>
<td>Y</td>
<td>N</td>
<td>Y</td>
</tr>
<tr>
<td>Promotes general behavior changes.</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>Promotes daily, individual behaviors and action.</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>Educational programming goals include: raising awareness, increasing understanding, changing behavior, and promoting advocacy.</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>Believes learning outcomes are interconnected (conservation, education, engagement).</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>Program seeks to establish emotional connection between visitor and ocean ecosystem.</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>Believes emotional connection supports behavior change and action.</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>Organization’s ultimate mission is conservation.</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>N</td>
</tr>
<tr>
<td>Organization’s ultimate mission is inspiration, connection, and action promotion.</td>
<td>N</td>
<td>Y</td>
<td>Y</td>
<td>N</td>
<td>Y</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Evaluation of Success</th>
<th>Site 1</th>
<th>Site 2</th>
<th>Site 3</th>
<th>Site 4</th>
<th>Site 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conducts formal program evaluation (any).</td>
<td>N</td>
<td>Y</td>
<td>Y</td>
<td>N</td>
<td>N</td>
</tr>
<tr>
<td>Uses qualitative visitor feedback as evaluation.</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>Evaluations are in-situ/short-term. There is little</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
</tbody>
</table>
Species counts are used as evaluation measure. | N | Y | N | Y | N

### Challenges & Constraints

| | Y | Y | Y | Y | Y |
| Curriculum development and delivery is constrained by human and social capital. |
| Organization structure limits quality of program delivery. | Y | N | Y/N | Y | N |
| Size and location factors limit visitor numbers/access. | Y | Y | Y | Y | Y |
| Public expectations diverge from organization’s strategies. | N | Y | N | Y | Y |
| Funding constrains quality of operation, including evaluation and expansion. | Y | Y | Y | N | Y |

### Roles & Responsibilities

| | Y | Y | N | Y | Y |
| Center identifies as a community resource or resource to field of environmental education. |
| Center identifies as a role model. | Y | Y | Y | Y | Y |
| Center incubates action. | Y | Y | Y | Y | Y |

### Discussion

This study set out to understand the landscape, or seascape if you will, of ocean and coastal education in Orange County as part of a larger field of environmental education. As part of that endeavor, this study sought to uncover either consistent or contradictory conceptualizations and approaches county-wide to the task of ocean education, the motivations behind them, and what roles the organizations identify with on a broader level. High-level education and executive employees of five informal ocean and coastal education centers were interviewed and their responses analyzed to learn the answers to these questions and what they might tell us about what we can expect from such organizations in the pursuit for global sustainability and environmental improvement.

The intention of the study was not to evaluate these organizations but to understand what they are doing and how that fits into this bigger picture of environmental education and the knowledge-action pathway.
Given the responses described above on topics of organizational goals, educational goals and objectives, strategies, and challenges, several themes emerged that help paint the picture of what informal, center-based ocean and coastal education organizations are doing and how they fit into the puzzle of environmental education.

**Integrated Education**

My intention when setting up this project and designing the interview tool was to learn about the educational activities taking place within the brick-and-mortar facilities of these organizations, places where the general public could wander in and encounter curated exhibits and displays and maybe participate in a guided tour. What I discovered quickly was that all but one of these facilities cater much less to those curious passers-by but rather emphasize activities for school tours.

With such a strong emphasis on aligning with California State Standards for education, one must, then, look to the content of those formal education standards and see how they themselves align with goals such as the Sustainable Development Goals. This will tell us where the emphasis is in education, formally and informally, and indicate whether such informal education organizations as the ones in this study are champions of SDGs to the degree that the progress of sustainability relies on.

While the nature of informal institutions allows them more flexibility in their content, officially, as well as in the ease with which they can implement changes, relative to the formal schooling system, the adherence to formal education standards highlights first that the informal education sector is not in all cases as easy a site for progressive sustainable development or transition education strategies to be anchored, and second that such ideals may have a better chance if pressure is put on both informal and formal education sectors to take them up.
The inclusion of standards-based content does not preclude additional content, but with a primary audience being school groups looking to meet those standards, accounting for not wanting to overwhelm learners with too much content, informal education organizations could easily choose to limit non-standards focused material.

Looking at this through another lens though, the emphasis on formal schooling standards and the high rate of school field trip tours, may signal integration with formal schooling rather than catering to them. Coupled with the novel, affective, relatable, and experiential methods of ocean and coastal education centers, the built-in relationship with schools rather broadens the reach of ocean and coastal education centers. By blending environmental education topics and engagement activities into other elements of formal schooling, such as the writing requirement that Site 2 helps schools meet, the skill set students come away with is rather broader than writing for writing sake and has the promise to be something closer to that up-with-the-times democratic education idealized by Dewey (2012).

So, while content may lean towards meeting whatever state standards are, the informal education organizations are able to incorporate that content into lessons that are connected to broader environmental topics and pass on skills and knowledge to make more pro-environmental behaviors.

To call back the social movement perspective, the centers and their audiences interact and must adapt to each other. Those in the study have adopted their frames and lessons to the particular context of their primary audience (Benford & Snow, 2000, p. 630).

**Emotional Educators**

As we learned from our review of education research, education and its outcomes are connected in a complex, not yet fully delineated path. The impact an experience has on a learner
is also influenced by the quality of that experience. Part of the quality of the programming provided by the organizations in this study was an emotional quality. The affective element seemed to take on two different forms. On the one hand, several organizations aimed to connect to learners’ existing emotions and leverage that affective connection to the material (e.g. caring about marine mammals) in order to help achieve their programmatic objectives as well as longer term objectives. On the other hand, several of these organizations set out to manufacture and develop emotions in their learners (e.g. inspiration, personalization) to establish those same connections.

Packings facts and experiences together with specific actions and sealing those up in their learners with emotional glue, the educators hope that their messaging will have greater impact on visitors. As mentioned above, some hoped this impact would even carry younger visitors through any immediate lifestyle changes to future careers in the ocean science or related fields. What does this mean for this pathway to action we are trying to visualize? In Orange County, informal educators consider emotional connection a key factor in helping to turn ocean and coastal education into future, and lasting action which is supported by a growing body of research (e.g. Pooley & O’Connor, 2000; Stern, 2000; Luebke et al, 2016).

Identity & Roles

What about the action side of this pathway we’ve been talking about? So far, much of what I have discussed has been about strictly inputs into the “knowledge” side of the equation. Several of these organizations, with their hands-on mock rescues, their advocacy letter writing, their trash games and the like, are using the action-outcomes as inputs themselves. That is to say they are having learners practice the outcomes. While this may seem like a particularly obvious strategy for the specific targeted behaviors some programs strive for, practicing their impact
gives learners a sense of the power of their own volition and a taste of what they can do to have a positive impact. Not only does this promote a sense of efficacy, they don’t have to translate information into action for the first time on their own after their visit, they get a jumpstart by practicing hands-on activities and careers.

Because of the challenges of evaluation that plague education research, generally, and the developmental stage of several organization, there have been no long-term evaluations or follow ups on behavioral changes from any of the organization’s in this study. This certainly makes it difficult to determine how effective the various strategies employed by these organizations are for knowledge retention and action. However, as has been mentioned, this was not quite the aim of this project.

The current and future intentions of these organizations, the roles they identify with, and the roles that can be ascribed to them from their responses tells us what sort of organizational landscape currently exists. This has practical significance in that it provides an idea of what organizations can develop to fill those niches left open and how they can operate so as to not overlap too much with what existing organizations are doing but be complementary as well. Something further that I was particularly hoping to unpack by asking outright what roles these organizations felt they played was to understand something closer to their image of themselves. The role they identify with, whether or not it seems to be the role they are fulfilling, something an evaluative study could undertake to determine, helps us understand what we might expect from these kinds of organizations, where gaps in the environmental educator field maybe, but also offer a lens by which to evaluate the state of and type of environmental knowledge among citizens.
Change Incubator. Considering the emphasis on trying to inspire or get people to care, to giving visitors the right kind of knowledge in the right way so that they take action and share with others, these organizations seem to overall be fulfilling roles as initiators of action or incubators of positive environmental sentiment. Several organizations also self-identified with this construct.

Taking on identities as incubators or initiators aligns with the similarly common hope amongst these sites that the visitors with whom they have direct contact will share the outcomes of their experience with other people in their networks; I think of this as a “domino effect” outcome. An initial concern with this process is that the experiences the centers offer are carefully crafted, immersive, and interactive, yet they expect and rely on their guests’ ability to present the gist of the experience without all the exhibitry or knowledgeable guides and have an equal impact on their friends so much so that those friends of the visitors then continue to spread the messaging and encourage action among their own friends. A second concern related to the first is how far that messaging could travel and still be effective. However, centers from this study also emphasize the importance that personalization and emotional connection has on making their messages stick and on getting visitors to care about the issues, especially when wanting visitors to take action on those issues. Additionally, in a political environment where environmental movement successes and attitudes are being rolled back at an alarming rate from the federal level, perhaps this grassroots, bottom-up approach, echoing grassroots mobilization mindsets, is the only way to continue or maintain positive gains (Williams, 2017).

The reliance on a grass roots method of education for behavior change could place these organizations more on that advocacy side of that line between “pure” education and advocacy that was discussed in the introduction. In some instances, one could consider such an
organization as akin to an environmental movement organization, mirroring some conservation movement mobilization tactics, particularly because environmental education as performed by several of these organizations appears to never be solely for the sake of knowledge gain but rather is information paired with calls to action. This offers more support for the benefit the field may have through combining some social movement mobilizations concepts with educational research to help explain how knowledge and action are connected.

The landscape of coastal education taking place in place-based centers in Orange County aligns almost perfectly with recommendations made for individual level actions in UN documents regarding SDG 14 (UN, 2018). What such documentation doesn’t include are the strategies by which such accomplishments should be made more frequent. We can turn somewhat to the environmental education literature regarding effective strategies, but we have already discussed how evaluation of strategies’ impact is challenging to carry out, so identifying silver-bullet techniques is a long way off.

Herein social movement mobilization literature could potentially offer some additional insight. To achieve critical goals, such as the SDGs, understanding what educators are doing and what other disciplines can offer to them by way of strategies to turn information into actions will be valuable. Perhaps, rather than thinking of visitors to these centers only as “learners,” achieving such goals may benefit by thinking of said visitors as potential converts, or bystanders needing to be mobilized. Other researchers (Jensen & Schnack, 1997; Hart, 1992; and Simovska, 2008 as cited by Laessoe, & Krasny, 2013) have discussed the argument over whether this is too close to indoctrination or “brainwashing” rather than an outcome of critical thinking skills and provision of knowledge from which participants make their own decision to act. But, it needs to also be considered that immediate action is needed in the case of
environmental improvement, and that that immediate action relies on shorter time frames between knowledge acquisition and action (Krasny & Dubois, 2016; Cox, 2010).

This brings us to a final point that we may be seeing a movement away from strictly visitor center-contained education models as the promise and impact of immersive, experiential, participatory programming increases. Perhaps that is what we have witnessed at the sites in this study, as each of these organization incorporates a more immersive, participatory, out-of-center experience and often cites those type of experiences as being key to having the impact they seek on their visitors or being key to educational outcomes. Some experimental research (e.g. Camasso & Jagannathan, 2018) is showing that, while not achieving significance, there is a positive trend between more intensive and immersive programs and outcomes like student grades. So, there seems to at least be some promise in this method.

Conclusions

To conclude, briefly, let us review the primary emergent themes uncovered in these interviews. First, integration with formal schooling while a factor in content creation helps bolster the efforts of environmental education but also highlights that, to those hoping to make major progressive changes via education, attention to both formal and informal structures is necessary. Second, emotional connection is considered a critical element to move visitors to action. Third, the center-based informal ocean educators serve or intend to serve as change incubators or jumping off points for improved knowledge formation, delivery, and training.

Some may also argue that these are places of education and that they are therefore expected to fulfill the role of information provider over action initiators. But, we can see from the interviews discussed within this study, that the organizations themselves identify with broader identities. The techniques the centers employ, such as creating an emotional connection
while raising awareness already align with objectives specific to inciting action. Maybe the time of separated information and prescribed action is over, after all what is the purpose of information or education if recipients are not meant to use it for a particular action?

From talking with each of the center-based ocean and coastal educators in this study, it seems rather a fair conclusion to say that while each has a different overall mission, they all hope for ultimately the same things, employ similar strategies, and talk about similar issues. There may be differences in degree, but overall there is a rather coherent, multi-level approach to ocean and coastal education in Orange County taking place at these kinds of institutions. This may not be an entirely unpredictable or surprising conclusion, but important, nonetheless. Had the opposite been true, it could make for a complicated push towards accomplishing any broader, even global, goals like those of the SDGs.

While it may be expected that the emphasis of any education-based organization would be on facts learned and knowledge gained, it seems from the consensus among sites in this study that more weight is given to the establishment of emotional connections, stimulation of curiosity, and inspiration. This finding reinforces work cited previously (e.g. Pooley & O’Connor, 2000; Stern, 2000; Luebke et al, 2016) suggesting emotion is a mediating variable in the knowledge-action pathway. The prevalence of and importance given to it across these sites suggests it could be a field-wide phenomenon and so demands attention.

**Limitations & Improvements**

This study used as its case sites only organizations that operated out of a visitor-center or science center. Extending to non-center-based organizations, such as those whose programming takes place in “outdoor classrooms” or those which operate primarily through outreach programming that takes place on school campuses, would provide a much larger and more
detailed landscape of ocean education in Orange County. It would be helpful to understand the variation, if any, across the different organizational types and see how they all fit together. As it is now, we have gotten to see one square of the patchwork quilt of ocean and coastal education. As with any interview-based research, there is a concern that participants may try to provide answers to questions that, while not false, paint a specific type of picture because they think that is what the researcher will want to hear.

Across the case sites, there was a rather lot of educational plans in the early stages of development. This may mean that, in the not too distant future, ocean and coastal education at these organizations may look slightly different as they grow into themselves.

An interesting future project could do a more direct comparison of the strategies and approaches of environmental education organizations to those used by environmental or social movement organizations’ mobilization tactics. Perhaps one field could provide insight for the other.

Finally, as the field as a whole has undergone near constant evolution since its inception, what the landscape of ocean and environmental education looks like right now, through these kinds of organizations, should likely not be expected to be static. The field could benefit from regular “pulse-checks” in the coming decades, especially as the global environmental agenda grows and gathers momentum it will be crucial to remain grounded in what is actually taking place in this field upon which so much rests.

**Application**

On a more superficial level, the responses of these organizations can point to how decision-makers or interested parties can help improve the operations of the organizations studied. For example, there was near universal acknowledgement of the need for funding. While
any organization could benefit from increased funding, something specific that funding can do for these organizations is establish evaluation frameworks. There was a pattern of only grant-funded school programming having any type of evaluation. With additional funding, more programs would be evaluated, and more effort could be put into valid and longer-term evaluations. This would be helpful for acquiring additional funding, as organizations are able to demonstrate their impact, they are able to capture the interest of additional funders. This would also be a major benefit to the broader field of environmental education, but particularly for those trying to understand how education factors into behavioral choices.

Relatedly, since most knowledge and impact-based evaluations are done under the purview of grant funded programming. It may follow that if grant funders start asking for follow ups for public programming, or longer term follow ups for any programming, informal educators could have the incentive, which many already possess, but more importantly the funding to carryout and analyze such evaluations. Complexities of evaluating impact notwithstanding, having improved information in this area regarding what types of programming are having the desired impact, and how much the environmentally conscious behaviors in the region are changing would be beneficial not only to the centers and their program developers, but also more broadly to the field of environmental and ocean education as well as policymakers and decision makers.

To repeat a previous statement, because there seems to be a generally universal approach to informal coastal education, and because we have a better understanding of what roles these organizations are playing, we can also get an idea of what new organizations can do to complement the existing landscape as well as how existing organizations might be able to accomplish at a more collective level.
Knowing directly from this sub-group of practitioners how specific types of environmental education, in this case ocean and coastal education, is conceptualized and put into action and the ultimate motivations for doing so has implications for global environmental change as well. Frameworks for change, such as the United Nations Sustainable Development Goals, could benefit from assembling an extensive record of research into practitioner definitions and motivations. Such research offers realistic signals for how well the two entities are aligned. If educational organizations are to have as much faith put into them as they have had in frameworks for change, in any field, knowing precisely what they are doing and why allows creators of said frameworks to more realistically incorporate them and make fewer assumptions or normative descriptions of their work. Similarly, more research on and communication with practitioners will reveal any disconnects between evidence-based best practices and actual practices being used and factors producing the disconnect.
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Appendix A: Interview Questions

Personal & Organizational Background

1. Can you tell me about your position here?
   a. How long have you been in this position? With this organization?
   b. Walk me through what a typical day or week is like for you.

Goals of Organization

2. Thinking about the organization’s goals, are they primarily focused on educational outcomes, conservation goals, connecting with the community? Or something else?

3. Do you know how those goals were decided? If so, would you walk me through the process
   a. What inspired them?
   b. Who was involved in that process?

4. Does the community have a voice in the process of coming up with your goals? Is the community’s benefit part of a particular goal?
   c. Who do you see as your constituents or community? Who do you serve?
   d. Does the organization see itself as having a particular role in the local community? Can you describe it for me?

5. Are there particular message(s) that the organization wants visitors to take away from their visit?
   e. Can you describe them to me?
   f. What are the types of connections that the organization would like visitors to make?
6. Has the mission or approach of the organization changed much since the organization was founded? If so, how? If not, why is that?
   a. Can you walk me through the most recent change and what the driving force behind it was?

Role Definition

7. Thinking about the following common objectives of environmental education, raising awareness, increasing understanding, changing behavior, and fostering advocacy, how is the work here divided amongst those? Or do you focus on something else I haven’t listed?
   a. Why do you think the organization’s has divided its work this way?
   b. What challenges and opportunities do you see tackling these tasks?
   c. Does your interest in modifying behavior influence what you decide to teach?
      How so?

8. Can you describe the techniques you use to accomplish each of those objectives?

9. Have those techniques been expanded to take on or include other broader issues?

10. To what extent do you focus on local ocean issues vs global issues vs general ocean/coastal knowledge? (as a technique to achieve your objectives?)
    a. Is the focus more balanced or single-focused- why has that been the pattern?
    b. Is this focus also seen in the/any civic engagement you promote?

11. Is building civic engagement part of your mission? Or something that helps you achieve your mission? How so?
    a. If yes, what programs do you think most help build civic engagement?
12. To what extent is your educational programming linked to any action the organization promotes?
   a. Can you describe an example or two with this link?
   b. Can you walk me through why the program was designed to include that link to action?

13. Does your organization promote specific short term environmental actions? Are they locally focused? Globally focused?

14. Has the organization incorporated any other local or regional issues into their content on their primary objective?

15. How do you define success for the programs or activities you engage in as an organization? What does success look like?
   b. Do you measure any specific outcomes for any of the programs?

16. What would you say are the top three activities or programs that help you achieve your mission?
   a. Why do you think these are your most successful?
   b. What objective do these programs focus on in terms of raising awareness, increasing understanding, changing behavior, or promoting advocacy?

17. What are the major constraints on the organization’s activities?

18. If there were no constraints, what activities would the organization do?
   a. What are things that you wish the organization could do?

19. Do you see this organization as having a role in helping Orange County transition to being a more sustainable place?
   c. What role is that?
d. How does that translate to or overlap with the organization’s mission?