
RESEARCH AND EVALUATION

School Administrator Influences on Classroom Ocean-Based Curricula: Lessons from a Professional Development Program in Hawaii

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This article discusses a dissertation study of teachers' inclusion of ocean literacy content in their classrooms following a grant-funded experience in Hawaii called Project ISLE: Integrated Science Learning Experiences. Upon analyzing 17 different qualitative data sources, the main factor influencing teachers' classroom inclusion of ocean literacy materials was the availability of administrative support for the program before, during, and after Project ISLE. Implications and recommendations are examined.

Keywords: Ocean literacy; administration; science education

Introduction

The human race depends on the oceans for a wealth of resources including food, climate regulation, transportation, medicine, and recreation. With such an influence on our lives, one might expect that society would take painstaking care of it. However, based on the current consumption of oceanic resources, the opposite seems to be true. This bias toward terrestrial issues, or 'terrestrialism,' as Bryan Norton (2003) described, has led to populaces that are historically deficient in basic ocean science understandings (US Commission on Ocean Policy 2004; The Ocean Project, 2009; AAAS, 2003; Pew Oceans Commission, 2003; Soares, 1998; Steel et al., 2005). For example, in one previous American study, Brody and Koch (1990) found that 86% of public school students studied knew little to nothing about key ocean science topics and carried misconceptions that could impact their future ocean decision-making abilities. Another longitudinal study found that 35% of the American public surveyed could not identify a single ocean issue affecting the country (The Ocean Project, 2009). In a commissioned survey, the American Association for the Advancement of Science (AAAS, 2003) found that despite concerns for the oceans, only 31% of Americans recognized that their daily choices could have an impact on the oceans.

These deficits inspired the creation of an international ocean literacy campaign. Ocean Literacy is defined as "an understanding of the ocean's influence on you and your influence on the ocean" (NOAA, 2013). This concept emphasizes public usage of ocean understanding to make informed choices in everyday life, thus making it closely linked to the five pillars of Education for Sustainable Development (UNESCO, 2005). Ocean literacy includes seven Essential Principles:

- 1.) Earth has one big ocean with many features.
- 2.) The ocean and life in the ocean shape the features of Earth.
- 3.) The ocean is a major influence on weather and climate.
- 4.) The ocean made Earth habitable.
- 5.) The ocean supports a great diversity of life and ecosystems.
- 6.) The ocean and humans are inextricably interconnected.
- 7.) The ocean is largely unexplored (Schoedinger, et al., 2010; NOAA, 2013).

Currently, a number of efforts are underway to determine the international community's level of ocean literacy. For example, Fauville et al. (2017) developed The International Ocean Literacy Survey (IOLS), to "detect progress toward, and so, to support the improvement of, international and potentially global

efforts to build public understanding of the importance of the ocean" (p. 4). The IOLS is available for use among high school students in 15 different languages (MARE, 2019), and their research efforts are ongoing. Additionally, Lotze et al. (2017) surveyed public perceptions of marine threats and protection among 32,000 people across 21 countries around the world and identified a key disparity in public understanding (Lotze et al.). Although 70% of respondents believed that human activities threatened marine ecosystems, only 15% thought the health of the ocean overall was at risk and mistakenly assumed that a much wider area of the ocean was protected by governmental factors. Lastly, the National Marine Educators Association Ocean Literacy Committee (2019) took painstaking care to align the ocean literacy principles with the Next Generation Science Standards (NGSS, 2013). They explain that teacher support is needed: "This alignment is a necessary tool to focus attention on places in the NGSS where Ocean Literacy is essential to understanding the [Disciplinary Core Ideas], but the connection may not be obvious" (NMEA, 2019). However, many educators still need more professional development and support to adequately incorporate the Essential Principles into their classrooms.

The need for ocean professional development for teachers

Although ocean literacy advocates have made significant progress in advancing ocean literacy, the public at large still has a long way to go in terms of widespread incorporation of ocean- promoting behaviors (Strang, 2008; Hoffman and Barstow, 2007). A main part of the problem is the absence of widespread ocean literacy professional development among school districts and teachers (Cava, et al., 2005; Gillan, 2011; Stock, 2010). As Hoffman and Barstow (2007) explain, "Teachers must be provided with the professional knowledge and skills, as well as curricular resources, to better integrate ocean literacy education into their teaching" (58).

However, in order to effectively foster professional knowledge and skills, the educational community must first understand what teachers' conceptualizations of ocean literacy are and the various patterns they take when incorporating professional development materials into their instruction. The research behind this article attempted to shed light on such pressing questions. I studied 12 Georgia teachers' conceptualizations and ocean literacy inclusion following a professional development program in Hawaii called Project ISLE: Integrated Science Learning Experiences. In total, I formed eight main data assertions as a result of the study. This article discusses the findings from one assertion: the impact of administrative support on teacher inclusion.

Literature Review

Professional development is a crucial aspect of teacher learning and continued growth in all areas including sustainability education. Intensive, ongoing preparation throughout teachers' careers enhances student learning and improves school environments (Fenstermacher & Berliner, 1985; Elmore, 2002). Best practices in professional development have been extensively studied, as well (Loucks-Horsley et al., 1996; National Research Council, 1996; Chval et al., 2007; Weiss et al., 2001; Garet et al., 2001). For example, in order to foster significant educational change, professional development programs must have a strong focus on content knowledge and provide opportunities for active teacher learning. Additionally, in their nationwide survey of teachers, they found that program duration, group attendance, and administrative inclusion have significant implications on teacher learning and program material inclusion (Garet et al., 2001). More specifically, they found when school administrative leaders attended the professional development or when teachers from the same school attended in groups, the likelihood of teachers including material from the program increased. Similarly, Oyetunji (2011) studied sustainability education in Botswana and found that participatory leadership promoted sustainability. Lastly, Redman (2013) found that one of the main barriers to sustainability education was the administrative pressure of high stakes standardized tests. Redman suggests that universities increase support for teachers through in-service professional development programs focused on sustainability education, which was one of the main goals of Project ISLE.

This research influenced the overall structure of Project ISLE in various ways including the length of the program, how teachers were selected, and the amount of follow- up time spent with participants. Understanding the research behind professional development and coupling that with the literature about the effects of teachers' beliefs on curricular choices helped me analyze teachers' inclusion patterns in the classroom. What's more, the Project ISLE directors requested teams of teachers to apply and encouraged administrator participation throughout. During the application phase, we gave preference to groups of teachers from the same school in accordance with the best practices in professional development described in Garet et al., (2001).

Methods

As mentioned, this study took place before, during, and after a professional development program known as Project ISLE (Integrated Science Learning Experiences) over the course of a year. Funded by The Georgia Improving Teacher Quality Grants Program, Project ISLE is a two-week program for Georgia public school teachers in Hawaii. With one week on the Big Island and one week on Maui, Project ISLE focused on a number of topics encompassed within the umbrella of ocean literacy including island ecology, conservation, and marine biology.

The research questions for my study were:

What are the impacts on: 1. teachers' conceptualizations and 2. classroom inclusion of ocean literacy-based science curriculum materials following an experiential marine science professional development program?

Project ISLE made an appropriate setting for this study due to the wide number of elements listed under each of the seven Ocean Literacy Essential Principles (NOAA, 2013) that it covered (**Table 1**).

Our daily program activities emphasized the scientific concepts within the seven Essential Principles, and I provided an overview of the ocean literacy principles at the end of the program and gave each teacher a copy of the Ocean Literacy Network (OLN) official ocean literacy brochure.

Participants

The participants included 11 teachers (five elementary, three middle, three high school) and one elementary administrator from four public schools in Georgia (**Table 2**). Due to the grant requirements, all five elementary teachers and the elementary administrator came from the partner school on the grant. The six secondary teachers included three middle grade Earth science teachers; two high school teachers who taught chemistry, biology, and forensics; and one high school teacher who taught oceanography and biology. All Project ISLE participants completed an application including a basic questionnaire, essay, and letter of support from a member of the teacher's administrative staff. To recruit program applicants, I presented at our grant's partner school and gave an additional presentation at a local science teachers' conference. The project directors selected participants from the applicant pool in a two-step process, due to the nature of the grant. First, we selected teachers employed at our high needs partner school. Next, we selected middle and high school teachers who showed outstanding commitment to improving the quality of their science

Table 1: Project ISLE Objectives aligned with Ocean Literacy Essential principles and Fundamental Concepts.

Program Objectives and GA Standards	Coordinating Ocean Literacy Principles and Fundamental Concepts
Volcanology (S2E1, S2E3, S3E1, and S5E1) <i>Volcanoes reshape the earth</i>	2d, 2e, 6f, 7b, 7f 2e
Coral reef ecology and organism identification (S1L1, S2L1, S3L1, S3L2, S4L1, S4L2, S5L1, S5L4) <i>Organisms adapt to unique environments</i>	5a,5b, 5c, 5d, 5e 5f, 5h, 6e, 6g
Island ecology and indigenous species (S1L1, S2L1, S3L1, S3L2, S4L1, S5L1) <i>To classify diverse species</i>	5a, 5c, 5d, 5f, 5h
<i>To protect endangered species</i>	2d, 2e, 6c, 5a, 5c, 5d, 5f, 5h
Other <i>To integrate all of these new understandings into their classroom practice</i>	6c, 6g 7f

(Linsky, 2012, p. 13–14).

Table 2: Participant Information.

Pseudonym	Grade Level	Subject (s)
Philip	6	Earth Science
Amy	6, 7	Earth Science, Life Science
Alissa	9–12	Chemistry, Biology, Forensics
Judy	10–12	Biology, Oceanography
Lee	10–12	Chemistry, Biology
Carly	4	All
Marie	4	All
Lisa	6	Earth Science
Emily	1	All
Sarah	1	All
Virginia	Admin.	n/a
Ashlyn	3–5	Science

Table 3: Data Source List.

Data Source	Date Collected	Number collected
1. Teacher applications	Feb 17 th –April 1 st	12 essays
2. Pre-program surveys	May 25 th –June 9 th	12 surveys
3. Teacher blogs	June 1 st –July 1 st	4 blogs
4. Pre-tests	May 25 th	12 pre-tests
5. Post-tests	June 20 th	11 post-tests
6. Fall planning forms	June 20 th	11 forms
7. Post-program survey	June 22 nd –July 31 st	11 complete post-surveys
8. Expanded field notes	June 1 st –June 21 st , Sep 15 th	22 days, 48 pages
9. Brainstorming sessions	June 9 th , 12 th , 17 th	3 group reflections
10. Lesson sharing demos	June 9 th –June 18 th	11 lesson plans
11. Teacher Field Journals	June 21 st –July 5 th	10 journals
12. Teacher units	July 21 st –August 30 th	7 total
13. Interviews	Sept 15 th –Oct 12 th	10 interviews, 5'20", 32" average
14. Follow up focus group	Sept 15 th	1 group interview, 58"
15. Teacher emails	May 26 th –March 1 st	Approximately 5 per teacher
16. Classroom observation field notes	August 1 st –Dec 2 nd	Observed: 6 in person, 2 digitally, 19 pages total
17. Pictures of classroom artifacts	August 1 st –March 1 st	32 photos

teaching. In total, the 12 participants had an average of 11 years of experience and included 10 females and two males. All participants submitted letters of recommendation as part of their application for Project ISLE, so they each had support from at least one individual in their administrations at the start. Lastly, all program participants volunteered to take part in the study and were given pseudonyms to protect their anonymity.

Data sources

My data included 17 different sources that were collected from the 11 teachers and one administrator over the span of one year (**Table 3**). Data collected during the program included: observations of participants in the field, teacher blog posts, lesson sharing demonstrations, and teacher field journals. Although the vast majority of the data that informed this study was qualitative, a few quantitative instruments were used to triangulate some of the qualitative findings.

A critical piece of the data collected came from two surveys: a pre-program and a post-program survey. The pre-program survey included basic demographic information including subjects taught, years of experience, and educational background. These included open-ended questions like 'What role does ocean

Table 4: Interpreted responses to Pre-Program Question: “Please describe the role ocean science education plays in your classroom.”

Level	Very Low	Medium	High
Name:	Alissa, Judy, Amy, Marie, Lee	Sarah, Emily, Ashlyn, Virginia	Lisa, Carly, Philip
Total:	5	4	3

(Linsky, 2012, 93).

science content play in your current classroom, if any?’ (**Table 4**) and more specific questions targeting the various ocean literacy essential principles, such as ‘In a typical school year, approximately how often do your classroom lessons include the following ocean-related topics?’ The pre-program survey also included individual context questions concerning teachers’ definitions and preliminary beliefs about Ocean Literacy and the role ocean science content and OL Essential Principles played in their classrooms.

Context: Teachers’ Classroom Inclusion Before Project ISLE

Before Project ISLE, most of the elementary and high school teachers stated that they typically included ‘low amounts’ of ocean science content in their classrooms (pre-program survey). On the other hand, two of the three middle grade Earth science teachers said they included ‘high amounts’ of ocean science content before the program because of the mandated state standards which include oceanography. The third Earth science teacher, Amy, said in her pre-program survey that she did not feel she included as much ocean content as she should in her classroom even though she taught the same sixth grade Earth science standards as the other two teachers. She explained she was not able to because: “It is hard to fit all of the state standards into a year; adding to them is a very rare opportunity” (Amy, Pre-program survey).

Methodology

To collect and analyze the data, I utilized grounded theory interpretive research (Erickson, 1986; Glaser & Strauss, 1967) with inductive analysis (Charmaz, 2006) and constant comparative analyses as my methodological framework. In other words, I collected data from a wide variety of sources over the course of a year and then transcribed (if applicable) and analyzed each data source using line-by-line coding and focused coding (Strauss & Corbin 1998). This means I assigned specific codes to each line in order to develop emergent themes (Taylor and Bogdan, 1984). I took several steps along the way to ensure that the data I collected were of high quality. For example, I systematically collected the data using consistent methods across sources, I maintained prolonged contact with participants, I conducted detailed audit trails of the data, and I had a panel of experts conduct critical reviews of instruments prior to implementation (Goetz and LeCompte, 1984; Silverman, 1993; Merriam, 1998; Patton, 2002). Lastly, a few basic quantitative methods were used in order to determine teachers’ ocean literacy proficiency before and after Project ISLE, such as Likert-style survey questions.

Since this was mainly a qualitative study with a high number of data sources, the overall scope of the study was purposefully small ($n = 12$) in one professional development program. The smaller number allowed me to look in depth at each teacher’s growth over the year. Therefore, in addition to conducting one individual interview per teacher, I conducted one follow-up group interview and ongoing virtual discussions on a special Facebook group. However, due to the small number of teachers in this study, further research is necessary. This study may serve as a baseline for future studies concerning teacher professional development in ocean literacy.

Findings

As discussed earlier, my research questions were: What are the impacts on: 1. teachers’ conceptualizations and 2. classroom inclusion of ocean literacy-based science curriculum materials following an experiential marine science professional development program? In total, there were eight main themes and assertions in this data. This particular paper discusses one of those themes centered on the impact of administrative support. However, I need to explain more about the teachers’ various professional contexts and abilities first.

The influence of administrative support

The elementary teachers received the highest level of administrative support. For example, Virginia described the effect that Project ISLE had on the school in her interview:

So I think this is a really special year that we were able to just make a school- wide splash about it...pardon the pun. (*Laughs*) But that's what's happening and I think that we're all feeding off of a really positive energy, but what we've been able to do is let the other teachers know what an amazing resource Hawaii is for our country and for education and for science (Interview with Virginia, October 6, 2011).

As mentioned above, all of the five elementary teachers came from the partner school for the grant. Since the school's administration agreed to partner with the Project ISLE leaders on the grant, they were more personally invested in the project's success. For example, the entire administrative team at the Project ISLE partner school was supportive of the program, with the principal assisting in the development of the program and helping recruit teachers, the Parent Teacher Association assisting teachers with funds for flights, and an Instructional Coach attending the workshop personally (Virginia).

Such a high level of teacher participation and administrative support caused Hawaii and ocean literacy to become a school-wide theme at the elementary school. In addition to an increase in the number of lessons they included, the six Project ISLE participants also gave a workshop for the faculty at pre-planning; created a school-wide bulletin board about their personal experiences; and sent information home to parents (**Figure 1**).

As a result, other teachers who did not participate in the program also included Hawaiian -themed ocean literacy materials in their curricula with fifth grade teachers making brochures about island characteristics, third grade teachers holding a grade level luau, and the music teacher helping fifth graders to write their own Hawaiian- inspired chant. While certain items were not directly tied to ocean literacy essential principles, such as a luau, fun activities like this served as a tool or framework to incorporate ocean literacy.

Conversely, at the secondary level, the administrative pressures of high- stakes testing outweighed middle and high school teachers' ambitions to include much of their professional development materials. One of the Earth science teachers, Lisa, described a decrease in the amount of ocean literacy she included in her classroom after Project ISLE because of high administrative pressures, which were preventing her from including ISLE ocean literacy material.

During Project ISLE, Lisa created a lesson plan for a school-wide Public Service Announcement concerning ocean environmental issues. She said, "These PSAs can be published in the [school] paper. Videos can be watched on the school distribution system or posted on School Tube. Perhaps a CD of all the PSAs could be



Figure 1: Bulletin board displayed outside the administrative offices at grant partner school for Project ISLE.

compiled and distributed” (Lisa, Post-program survey). In her group interview response she explained their plan to create a mural about Hawaii using interdisciplinary work:

... we wanted to be able to do a cross-curricular type thing, like getting kids writing haikus or stories and just posting their work at different places along the mural. And as we learn these things in science you know the kids could talk about diagramming a wave or talking about ocean currents or ... how do we depend on the oceans? ...Even the math. You know, to be able to get the numbers in there. How big are the oceans? What’s the biggest ocean? Ranking them, comparing them in terms of square miles. ...I think what we envisioned with the mural is getting all the teachers involved. It would be some language arts, mathematics, and the kids in all the different classes would be engaged in it and have a part in it as opposed to just our science classes (Response in Group Interview, Lisa, September 15, 2011).

However, their plans were unable to come to fruition due to a lack of administrative support and intense pressure on the teachers to improve standardized test scores. The section below describes their situation:

When I observed [Lisa and Amy]...both were very apologetic...Amy explained that she had not had a planning period in two weeks because she had daily data analysis meetings...Both teachers explained that they wanted to include more of their experiences, and that they had shown their students some pictures and shared stories, but they just did not have the time to plan new creative lessons... (Observation notes, February 16, 2012; Linsky, 2012, 117–118).

On the other hand, one Earth science teacher, Philip, received a high level of administrative support not only to include his professional development materials from Hawaii, but also to share them with others in his district. Like the elementary teachers, Philip delivered a professional learning workshop to other Earth science teachers at his school. What’s more, his principal hired a substitute teacher to allow him to deliver the same workshop for the other Earth science teachers at two other middle schools in his county. Philip’s administrator was not a participant in the program, and the reasons behind his administrator’s support are unclear. It is also unclear whether other administrator attendance at the middle or high school levels would have increased inclusion for the other secondary teachers.

Alissa and Lee, two high school forensics and chemistry teachers, only found time to teach one or two lessons. For example, Alissa collected sand samples at various places around the islands and created a murder mystery ‘Sands of Crime’ lesson for her forensics class. However, she admitted in her interview that that was the only time she felt that her standards and her administration allowed her to include her Project ISLE material. Lee echoed the same sentiments, only including one fish identification lesson. Therefore, Alissa and Lee’s ocean literacy inclusion remained low. Judy, on the other hand, who was an oceanography teacher, stated that she included material from Project ISLE “almost every day” (Table 5).

The increase or decrease in ocean literacy content inclusion following Project ISLE can be attributed to the teachers’ level of administrative support. Teachers included Project ISLE ocean literacy-based material both in their individual classrooms and within the larger school community if they received sufficient support and approval from their administration.

Table 5: Responses to Interview Question: “What impact, if any, have your experiences in Hawai`i had on your teaching?”

	One or two lessons only	Regular inclusion of anecdotal stories/pictures information	Consistent, regular inclusion using a wide variety of sources—not just pictures and personal stories
Name:	Alissa Lee	Lisa Amy Emily Ashlyn	Judy Virginia Sarah Marie Carly
Total:	2	4	5

(Linsky, 2012, 125).

Discussion and Conclusion

I attempted to shed light on how administrative support of ocean literacy professional development programs influence teachers' classroom choices for inclusion. The findings of this study both support existing research and raise questions for future research. The secondary teachers' hesitancy or inability to include their Project ISLE ocean literacy material is a concern. This finding supports Gillan (2011) and Stock's (2010) studies that describe state standards as perceived barriers to ocean literacy inclusion. Additional research is needed to better understand how teachers find ways to include ocean literacy in their standards-based curriculum, especially given the recent changes to the Next Generation Science Standards (NGSS, 2013) and the Common Core Curriculum Standards (2014). One possible answer to this concern may be including administration in ocean literacy professional development experiences or incorporating additional partner schools.

This assertion also supports and refines existing research about the importance of administrative support and team attendance for classroom inclusion of professional development materials. As described earlier, Garet et al. (2001) reported that teachers who attend professional development courses in teams from the same school tended to include more material than teachers who attend workshops alone. Garet et al. (2001) also described the benefits of having administrative leaders among the participants in professional development programs.

The teachers who described the lowest level of after-program support from their administration (the high school teachers and Lisa and Amy) also displayed the least amount of professional development material inclusion. Based on the data, the level of teachers' ocean literacy inclusion was influenced by the level of administrative support for the inclusion following the program. This administrative support caused Hawaiian-based ocean literacy to become a theme of the school and prompted non-participating teachers to add Project ISLE content to their classroom curricula. Still, additional research would be needed to understand exactly how the various levels of administrative support (attendance, general support afterward) influence the teaching of professional development program material.

Several other questions remain unanswered with regard to the assertion of administrative support fostering professional development material inclusion. For example, it is unclear whether participants' inclusion would have changed had the program taken place in a less exotic location, such as the coast of Florida. It is possible that administrators and students were naturally more curious to learn about Hawaii, since it was such a long distance from the location of their school, and therefore more receptive to the participants' information. Additional research is necessary to investigate whether programs like Project ISLE on the mainland have similar effects.

The ocean is largely ignored in classrooms, and the health of the oceans continues to suffer. If future generations are going to enjoy the same levels of oceanic resources, we must take steps to prepare future ocean citizens through effective ocean literacy professional development. This study demonstrated that when administrators give support to ocean literacy professional development, teachers will include ocean-related lessons, activities, and even community outreach at a much higher rate.

Competing Interests

Dr. Linsky received partial compensation as a co-instructor for Project ISLE by the Improving Teacher Quality Grants Program. Dr. Linsky also serves as the Chair of the Current Committee for NMEA which is on a voluntary basis.

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