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Relationships Between K-12 In-Service Teachers' Personal Environmental Education Teacher Efficacy, Environmental Identity, and Concern for Implementation of California's Environmental Principles and Concepts

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Relationships Between K-12 In-Service Teachers'
Personal Environmental Education Teacher Efficacy, Environmental Identity, and Concern for
Implementation of California's Environmental Principles and Concepts

By

Dean M. Reese

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In Partial Fulfillment of the
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University of the Pacific
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2023

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By

Dean M. Reese

Dedication

This dissertation is dedicated to my loving family who have supported and inspired me throughout this process. Your patience and encouragement helped me find the energy and strength to accomplish this lifetime achievement. I couldn't have done it without your support and sacrifice. I love you all very much!

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My gratitude goes to the professors at the University of the Pacific who planned and facilitated the many outstanding educational experiences to help my cohort of doctoral students grow into the scholars that we have become. I would like to especially acknowledge my dissertation committee for their significant investment in my educational journey. Dr. Lieberman, thank you for your leadership in environmental literacy nationally, and throughout the state of California. Early on, you presented me with the book, “Taking Charge of Change”. This gift set me down a path to think deeply about how to work with teachers to help shape their practice, eventually leading me to leverage the Concerns-based Adoption Model in this dissertation. Dr. Keithcart, thank you for setting a great example for your students. You took the time to share your dissertation with us and modeled the thoughtful and intellectual approach that goes into crafting a dissertation. Dr. Hackett, I feel so fortunate that you were able to serve as the chairperson for my dissertation committee. You provided countless hours of mentorship during the conceptualization of my dissertation, proposal, analysis, and defense. I couldn’t have done it without you, and I am truly grateful for all that you give of yourself to your students. You are a testament to the excellence of the University of the Pacific.

Relationships Between K-12 In-Service Teachers'
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Implementation of California's Environmental Principles and Concepts

Abstract

By Dean M. Reese

University of the Pacific
2023

Significant environmental impacts such as climate change, reduction in biodiversity, increasing food scarcity, impacts on water supply and availability, and exacerbation of human health problems are occurring and are expected to increase. Despite these environmental challenges the teaching of California's environmental literacy standards, the California Environmental Principles and Concepts (CA EP&Cs), in the K-12 public education system is infrequent and inadequate. The purpose of this study was to use a mixed methods approach to examine relationships between environmental identity (EI), personal environmental education teacher efficacy (PEETE), and peak stage of concern (SOC) for implementing CA EP&Cs for K-12 in-service teachers participating in regional 3-year California Environmental Literacy Projects (CELP). In the last year of CELP, a survey was given to 72 of the participating teachers to probe their EI, PEETE, and peak SOC for implementing CA EP&Cs. Eighteen months after the conclusion of CELP, five participating teachers engaged in a follow-up interview providing further insight about the relationships between EI, PEETE, and peak SOC for implementing CA EP&Cs. The findings from quantitative analysis of the survey and the qualitative analysis of the follow-up interviews indicate that participating teachers had high levels of EI and PEETE, and that there is a moderately large correlation between EI and PEETE within the sample of teachers surveyed. These high levels of EI and PEETE did not translate into impact level peak SOC in the

Concerns-Based Adoption Model (CBAM) for most teachers. This finding demonstrates that environmental literacy professional development providers, site and district administrators, and teachers will have to overcome significant challenges to be able to increase the environmental literacy for students in California's educational system. For environmental literacy professional development providers, it is suggested to surface teachers' individual challenges to implementing CA EP&Cs and provide explicit recommendations to overcome these challenges. For district and site administrators, it is suggested that the CA EP&Cs be prioritized as important standards that are taught, and that student access to outdoor field experiences be valued and funded. For teachers, it is suggested to prioritize the teaching of CA EP&Cs and to integrate environmental literacy into the teaching of the various content areas where appropriate. Further details and additional suggestions are outlined in this research study.

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CHAPTER 1: INTRODUCTION

Environmental Literacy is Essential

Now, more than ever before, is a pressing need to educate our nation's K-12 students in the discipline of environmental education and develop our student's environmental literacy. We live in a time where we are facing unprecedented risk to our environment from human impacts. As humans access natural resources to fuel the economic activity for nations throughout the world, environmental impacts such as climate change, deforestation, reduction in biodiversity, increasing food scarcity, impacts on water supply and availability, exacerbation of human health problems, increase in extreme weather events, and increased risk of mortality and morbidity during periods of extreme heat are being encountered today and are expected to continue with increasing severity into the future (IPCC, 2014). When faced with such astounding environmental impacts it is imperative that students throughout the K-12 grade span learn about these issues and learn how we can begin to address these issues to curb environmental impacts and move toward a more sustainable future.

In many cases, specific communities or groups of people are disproportionately burdened with environmental hazards or denied access to environmental benefits. "Environmental justice is defined as the fair treatment and meaningful involvement of all people regardless of race, ethnicity, income, education level, in the development, implementation, and enforcement of environmental laws, regulations, and policies" (Federal Register, 1994, p. 7629). Environmental justice, a critical component of environmental literacy, should be addressed in the K-12 education system so students can be aware of the disproportionate impacts of environmental hazards on marginalized communities and the historical and systemic factors that have led to

these disparities. Students can be empowered to explore solutions to these problems and take actions towards a more just system (Lerner, 2012). Students and families deserve to know about the environmental impacts that may be affecting their health and their well-being. Environmental literacy and environmental justice should be included in the K-12 education of students.

In 2001, the Elementary and Secondary Education Act better known as NCLB embraced a high stake testing paradigm which ultimately narrowed the curriculum for students (Leistyna, Lavandez, and Nelson, 2004). The federal mandates of NCLB “increased the emphasis on standards, testing, and classroom pedagogies that ‘teach to the test’ while denying students and teachers opportunities to experience critical or place-based education” (Grunewald, 2008, p. 308). This led to a decrease in emphasis on multidisciplinary subjects like environmental education in favor of more mainstream disciplines like English Language Arts and mathematics. In states like California, the narrowing of the curriculum has persisted post the NCLB era, to the detriment of disciplines like science and history/social science. Environmental literacy lives within these already marginalized disciplines, causing further marginalization of this important discipline.

Unfortunately, the scientific literacy of California’s teachers and the disproportionate instructional time given to the discipline of science in K-12 schools as compared to English/Language Arts (ELA) and math raises questions regarding the preparedness for teachers to address the charge of providing high quality environmental education to our students. A nationally represented survey taken by teachers in the 2006 - 2007 school year reported elementary schools spending only 178 minutes per week on science instruction vs. the 503 minutes on ELA instruction and 323 minutes spent on math Instruction (National Research Council, 2011). More specifically in California, a 2007 study focusing on 9 counties in the San

Francisco Bay Area revealed an even starker de-emphasis on science instruction in elementary schools. This study revealed that 80 percent of K-5th grade multiple-subject teachers responsible for teaching science in their classrooms reportedly spent 60 minutes or less per week on science, with 16 percent of teachers spending no time at all on science (Dorph et. al., 2007).

Furthermore, the COVID Pandemic has further exacerbated these deficits in science instruction. In (2020), WestEd produced a webinar reporting survey results from the K-8 Science During COVID Survey. In this survey, 88% of K-8 teachers reported spending somewhat or significantly less time on science as compared to the pre-COVID era. Additionally, WestEd (2020) reports in the same survey that in the distance learning paradigm created by the COVID pandemic, less data analysis related practices, less facilitation of scientific discourse, less phenomenon-based instruction, and less engineering is being incorporated into science teaching by K-8 in-service teachers. These findings illustrate the current and historically disproportionate focus and instructional time provided to the disciplines of ELA and math as compared to other core disciplines such as science. Many teachers in the California public school system are not only teaching in this paradigm but have also been taught under these conditions. This has led many elementary teachers to have deficits in scientific and, more specifically, environmental science background knowledge, and lack the requisite experience and knowledge to teach environmental science effectively. Less than 40% of elementary science teachers self-reported that they feel adequately prepared to teach science (Dorph et. al., 2011).

In order to accomplish the challenge of providing students with the environmental literacy necessary to understand the complexity of the interaction between human systems and natural systems, a variety of factors must be understood and addressed in our education system. The focus of this research will be at the intersection between personal environmental education

teacher efficacy (PEETE), environmental identity (EI), and the concern for implementation of California's Environmental Principles and Concepts (CA EP&Cs). This research aims to determine the associations between these topics for a subset of K-12 teachers who teach in California and have participated in California Environmental Literacy Projects (CELP).

In 2019-2022, the California Department of Education provided grant funding with the goal to increase students' environmental literacy levels through CELP programs. These grant funds were awarded to 5 different county offices of education throughout California and the funding was sustained for 3 consecutive years. This research primarily focuses on the CELP program that was awarded to San Joaquin County Office of Education and was conducted in the third year of its 3-year implementation cycle. It is my assumption that achieving the goals of this grant depends on teachers having high personal environmental education teacher efficacy and a well-established and highly developed environmental identity. Therefore, the focus of this dissertation is on both of these concepts and the relationship between them and the concern for implementation of CA EP&Cs for participating teachers in this study.

"Environmental identity is a stable sense of oneself as interdependent with the natural world" (Clayton 2012). Research has shown an association between environmental identity (EI) and pro-environmental behavior (Clayton & Opatow, 2003). Can a teacher effectively change the identity of their students without embodying that identity themselves? The level of EI of the participating teachers in CELP programs will be determined in the 3rd year of the CELP programs.

Teacher self-efficacy refers to the concept of a teacher's belief in their ability to influence student learning and achieve desired outcomes. (Tschannen-Moran & Wolfolk, 2007). The idea that teachers who believe they have the ability to do something will attempt and can often

succeed in accomplishing this feat is central to this idea. If this concept is applied to environmental education, a teacher with high environmental education teacher self-efficacy is more likely to incorporate a lesson intended to increase the environmental literacy of their students into their teachings. Furthermore, research has shown that teachers with a high level of self-efficacy produce higher levels of student achievement in their students (Bray-Clark & Bates, (2003). This study aims to determine how Personal Environmental Education Teacher Efficacy (PEETE) affects the concern for implementation of California's EP&Cs.

Statement of the Problem

Exploring the idea of science teacher self-efficacy associated with the implementation of environmental education has been studied with pre-service teachers on several occasions. This is often motivated by accessing teachers at a time where their development is impressionable and are likely to incorporate newly developed skills into the beginning of their teaching careers with the hopes that this development will be sustained throughout the duration of the teacher's career. However, it is unusual to find research that considers science teacher self-efficacy with in-service teachers in relation to their implementation of environmental education. Even more rare in the body of research is to find studies specifically involving environmental education teacher self-efficacy in association with the implementation of environmental education with in-service teachers. Furthermore, these studies are often limited to qualitative methodology and there is a need for quantitative studies that examine this relationship. Currently, it is unknown what the overall EI of California K-12 teachers is and if this EI is associated with high environmental education teacher self-efficacy. Do these two factors affect the implementation of CA EP&Cs? These details and their implication on the implementation of high-quality environmental education are largely left unanswered in the body of research. Finding answers to

these questions can support the professional learning needed to equip in-service teachers with the skills, identity, and efficacy to help today's students understand and address environmental challenges in their communities, states, nations, and globe.

The Purpose of Study

This study aims to fill the gaps in research by using a mixed methods approach to examine relationships between environmental identity, personal environmental education teacher efficacy, and concern for implementing California's Environmental Principles and Concepts for K-12 in-service teachers. The subset of California teachers that will participate in this study are in-service teachers from 5 regions in California that are participating in the California Department of Education's California Environmental Literacy Project (CELP) program.

Research Questions

The first 7 research questions will be applied to teachers who have participated in a regional CELP program and have agreed to complete the Environmental Literacy Education Questionnaire. The remaining 3 questions will be applied to a subset of teachers who agree to follow-up interviews.

Part 1 – The Big Picture

1. What is the level of Environmental Identity (EI) of teachers who participate in California Environmental Literacy Project (CELP) programs?
2. What is the level of Personal Environmental Education Teacher Efficacy (PEETE) of teachers who participate in CELP programs?
3. What is the peak Stage of Concern (SOC) of implementing CA EP&Cs for teachers who participate in CELP programs?

4. What potential barriers and/or concerns do teachers who participate in CELP programs report for the implementation of CA EP&Cs?
5. Is there an association between the levels of EI and PEETE for teachers who participate in CELP programs?
6. Is the peak SOC for implementation of CA EP&Cs associated with the level of EI for teachers who participate in CELP programs?
7. Is the peak SOC for implementation of CA EP&Cs associated with the level of PEETE for teachers who participate in CELP programs?

Part 2 - A Closer Look

8. Who are the teachers participating in follow-up interviews?
9. How do these teachers describe themselves in the context of teaching environmental literacy?
10. How do these teachers feel their participation in the CELP program affected their teaching of environmental literacy?

Methodology

The methodology used in this mixed methods study is a non-experimental design combining elements of quantitative and qualitative analysis. A researcher-created survey (see Appendix B) titled the Environmental Literacy Education Questionnaire (ELEQ) was given to participating teachers in the third year of the California Environmental Literacy Project (CELP) program. The ELEQ includes a demographic section, the Environmental Education Teacher Efficacy Belief Instrument (EETEBI), the Environmental Identity Scale (EID), the Stages of Concern Questionnaire (SOCQ), and an open-ended question regarding the educator's concern for teaching California's Environmental Principals & Concepts. The ELEQ provided data to

determine the level of environmental identity (EI) of the participants, the level of personal environmental education teacher efficacy – a subscale of the environmental education teacher efficacy belief (EETEB) of the participants, and the frequency of the peak stage of concern for the participants. Additionally, Pearson correlations were used to determine the relationships between EI, PEETE, and the peak Stage of Concern for implementation of California's EP&Cs within the sample of participants.

Then, a closer look was taken by conducting follow-up interviews (see Appendix B for follow-up interview protocol) on five of the participants. The qualitative approach used was borrowed from the tradition of case study and specifically uses an embedded case study design. The bounded system for the case study was defined as teacher participants involved in one of five CELP programs that agreed to follow-up interviews, and the subunits embedded within the single case are the individual teachers. The participant responses from the follow-up interviews were analyzed using a constant comparative method to analyze within-case themes.

Significance of the Study

The primary significance of this study is to provide insight to the field regarding how Environmental Identity (EI) and Personal Environmental Education Teacher Efficacy (PEETE) impact the concern for implementation of the CA EP&Cs by teachers in the K-12 setting. One of the major aims of professional development for teachers is to improve the quality of instruction in order to improve student learning. In a world facing a vast array of environmental challenges it is critical that we are graduating environmentally literate students who have the ability to engage civically in their local, state, national, and global communities. In California, this starts with in-service teachers implementing the CA EP&Cs.

This research aims to provide insight for other environmental literacy professional development providers regarding how a teacher's EI, a teacher's PEETE, and peak Stage of Concern (SOC) for implementing the CA EP&Cs are related. Questions remain which of these factors correlate most with instructional practice. Does one of these factors have a larger impact on the practice of teachers? Or is it that EI and PEETE have no significant correlation on the peak SOC for implementation of teachers in this study? The answers to these questions and others like it could provide information to environmental education teacher professional development providers in terms of how to most effectively spend the limited time and resources allotted to professional development in this critical domain.

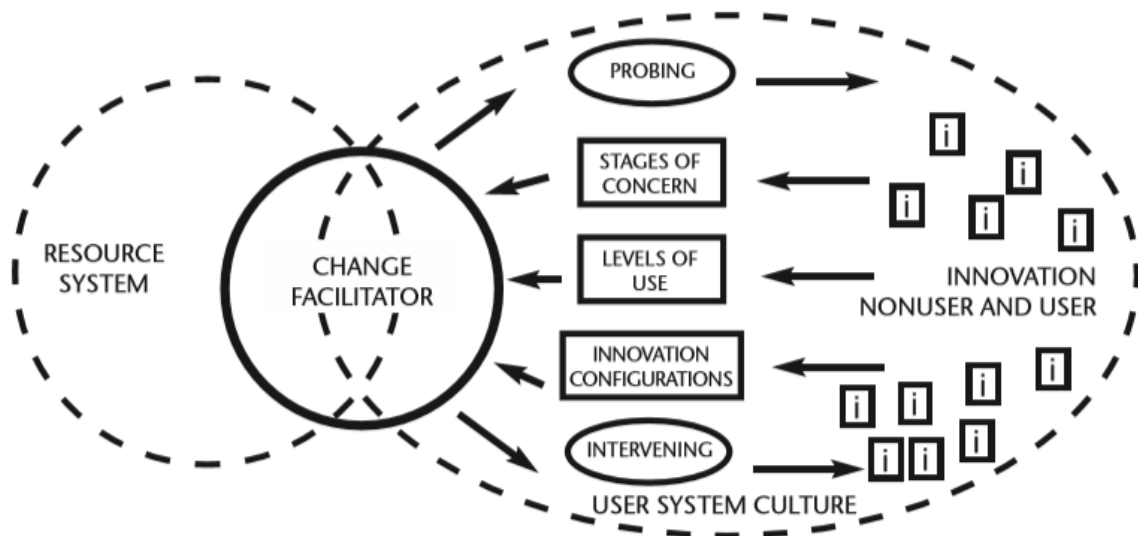
Another significance of this study is it will surface the barriers and challenges that California teachers perceive in implementing the CA EP&Cs. This is useful as once these challenges have been identified environmental literacy professional development providers will have insight into how to incorporate topics in their professional development workshops to directly address these barriers and concerns. Additionally, site and district administrators who would also like to increase the implementation of CA EP&Cs in their schools will better understand the concerns teachers are having that may be preventing this implementation.

Conceptual Framework

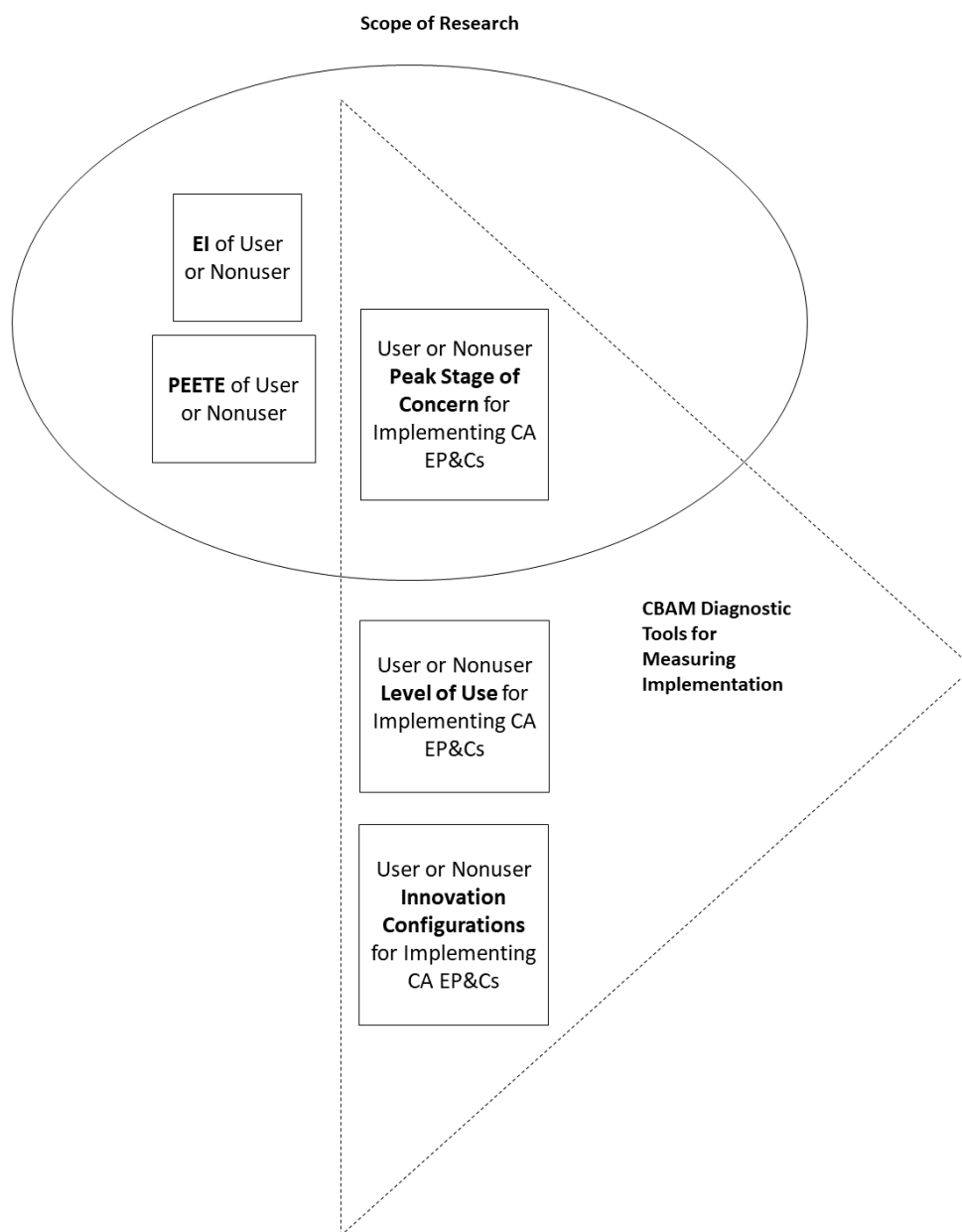
The conceptual framework being used in this study combines Environmental Identity (EI), Personal Environmental Education Teacher Efficacy (PEETE) – a subscale of Environmental Education Teacher Efficacy Belief (EETEB), and peak Stage of Concern (SOC) for implementation of California's Environmental Principles & Concepts (EP&Cs). The framework suggests that both EI and PEETE contribute to the peak SOC a teacher has for

implementing CA's EP&Cs. How these variables relate is unknown, but there is an expected relationship.

The part of the conceptual framework that pertains to the concern for implementation is borrowed from the Concerns Based Adoption Model (CBAM) established by Hall (1973). Hall's CBAM framework is concerns-based in the sense that it considers the user of the innovation's concern with adopting an innovation in their practice. In this study, the innovation is considered to be the implementation of California's EP&Cs. As shown in Figure 1, the Concerns-Based Adoption Model presented in the book *Taking Charge of Change* involves a change facilitator with access to a resource system for the innovation and is working with probing and intervening to understand and facilitate change for the adoption of an innovation by considering the stages of concern, levels of use, and innovation configurations of the individual. For the purpose of this study, the change facilitator is the individual/organization leading the professional learning for the California Environmental Literacy Project program. A Stages of Concern Questionnaire will be collected from participating individuals to better understand their concern for implementation of California's EP&Cs via the CBAM conceptual framework.

Figure 1*Concerns-Based Adoption Model*

To further understand the conceptual framework of this study, imagine that the “innovation nonusers and users” from Figure 1 enter into the professional learning environment each carrying with them their own personal EI and PEETE. My assumption is that the level of EI and PEETE that each teacher brings to the professional learning will contribute to their peak SOC and ultimately affect their implementation of CA EP&Cs. I aim to quantitatively determine these relationships. See Figure 2, Scope of Research, for a visual representation of the scope of the study. The scope of this research does not include the full CBAM model. Only the relationships between EI, PEETE, and peak SOC from CBAM will be determined in this study.

Figure 2*Scope of Research*

Organization of the Manuscript

This manuscript began with a holistic introduction to the study and next provides a comprehensive review of the literature in Chapter 2. Here, the major concepts of the study, such as Environmental Identity, Personal Environmental Education Teacher Efficacy, Concerns-Based Adoption Model, concern for implementation of California's EP&Cs will be discussed. Chapter 3 focuses on the methodology of the study, describing the participants, instrumentation, procedures, and data analysis plan. In Chapter 4, the data and the findings from the analysis are presented. In Chapter 5, a summary of the research is given along with implications for practice, suggestions for further research, and concluding remarks.

CHAPTER 2: REVIEW OF THE LITERATURE

Introduction

Chapter 2 provides a review of literature on the central topics for this proposed inquiry including Environmental Identity (EI), self-efficacy and more specifically Environmental Education Teacher Efficacy Belief (EETEB), Personal Environmental Education Teacher Efficacy (PEETE) – a subscale of EETEB, the Concerns-Based Adoption Model (CBAM), Stages of Concern (SOC), and environmental literacy in California. These topics will be presented in terms of their connection with the implementation of California's Environmental Principles and Concepts (CA EP&Cs). This chapter provides the foundation for why the problem statement of determining the relationships between EI, PEETE, and peak Stage of Concern for the implementation of CA's EP&Cs was addressed in chapter 1.

The research in this literature review was screened based off the criteria of giving priority to recent peer reviewed academic journal articles whenever possible. Many of the following key words were used in the searches made to review the literature: environmental literacy, environmental education (EE), Environmental Identity (EI), student environmental identity, teacher environmental identity, Environmental Identity Scale (EID), self-efficacy, teacher self-efficacy, environmental education teacher self-efficacy, Environmental Education Teacher Efficacy Belief Instrument (EETEBI), Personal Environmental Education Teacher Efficacy (PEETE), Concerns-Based Adoption Model (CBAM), implementation framework, quantitative, qualitative, mixed-methods.

The review of the literature will begin with environmental literacy and its importance and then move to the current landscape and historical perspective of environmental literacy in

California. From there a thorough development of the research on EI and EETEB will be presented. Then the Concerns-Based Adoption Model (CBAM) will be discussed and how it pertains to this study. Finally, the chapter ends with justification for why determining the associations between teachers' levels of EI and PEETE on the concern for implementation of CA EP&Cs will fill a gap in the research within this field.

Environmental Literacy

Background Information

People across the globe face environmental challenges such as loss of biodiversity, poor air quality, poor water quality, increased frequency and intensity of wildfires and storms. "In recent decades, changes in climate have caused impacts on natural and human systems on all continents and across the oceans" (IPCC, 2014, p. 4). Environmental Education (EE) is an essential strategy in the mission to address these environmental concerns locally and globally (United Nations, 1992). This idea was emphasized in the Bonn Declaration occurring at the UNESCO World Conference on Education for Sustainable Development in 2009. "Education is recognized as one of the key drivers for moving society in the direction of sustainable development" (UNESCO, 2009, p. 40) However, this can be a challenging proposition. "The conceptual and methodological foundations of EE were developed in the 1970s and 1980s when it was assumed that energy and environmental problems could be adequately addressed through resource conservation and incremental changes to technology and human behavior" (Jorgenson, S., Stephens, J. C., White, B., 2019, p. 160) New approaches to EE will be needed to address the environmental issues that we currently face (Nelson and Cassell, 2012).

Many researchers have recognized the need to move to a more sustainability focused educational experience for students. "Contemporary schooling practices do not appear to be

taking human-environmental relationships and critical ecological, social and economic issues seriously” (Nelson and Cassell, 2012). Stone (2010) reminds us that “curriculum is anywhere learning occurs” (p. 35) and therefore the actions of the school in terms of the sustainability of its operation, recycling programs, carbon footprint of daily lunch service, waste management and the sourcing and use of materials and resources are all part of the curriculum that students experience. The systems thinking that is involved in sustainable living and operation of our schools and businesses requires a shift in perception from educators throughout the educational system (Stone, 2010).

Implications

There are examples of success in EE implementation. An example of the effectiveness of education as a means to address environmental challenges can be seen in Cordero EC, Centeno D, Todd AM’s (2020) research. They demonstrated that the average course graduate of a freshmen level year-long college course sequence produced environmental behaviors resulting in the reduction of individual carbon emissions by 2.86 tons of CO₂ per year. This study was conducted 5 years after the implementation of the course suggesting that environmental education for adults can have effective outcomes when working to address environmental issues. This promising result worked with adult undergraduate students, but how is environmental education happening at the K-12 grades in California and what are its effects on local, national, and global environmental challenges?

Environmental Literacy in California

Environmental Concerns in California

California faces its own fair share of local, regional, and statewide environmental issues. In California’s Fourth Climate Change Assessment Statewide Summary Report (2018), due to

climate change, wildfires are projected to become more extreme, erosion of beaches in Southern California are expected due to sea level rise, direct and indirect risks to public health are expected, and climate impacts are likely to affect disadvantaged communities disproportionately. Furthermore, in the American Lung Association's State of the Air report (2020) California cities including Bakersfield, Fresno, Visalia, Los Angeles, San Jose/San Francisco/Oakland ranked as the top 5 most polluted cities by year-round particle pollution affecting over 31 million residents. Water on a statewide scale is also a concern in both its availability above and below ground, as well as the quality of water for drinking. "Increases in temperature are already causing decreases in snowpack" (DWR, 2020) and "by the end of the century, California's Sierra Nevada snowpack is projected to experience a 48-65% loss from historical April 1 average."

Furthermore, climate change is expected to lead to increased variability in weather patterns leading to more intense droughts and flood events. (DWR, 2020). These climate model projections have prompted leaders throughout the state to set goals in order to mitigate the worst effects of climate change. In 2018, Governor Brown signed an executive order to attain carbon neutrality by 2045. (Ramanathan V., 2019). Janet Nepolitano, President of the University of California (UC) system set goals for the UC system to be net carbon neutral by 2025 (Ramanathan, V., 2019). This was part of her Climate Neutrality Initiative. In 2015, she brought more than 50 UC researchers together to produce scalable solutions to flattening the curve of carbon emissions across the globe. "Within those 10 solutions is a call to 'foster a global culture of climate action through coordinated public communication and education at local to global scales'" (Ramanathan, 2019). This leads to the question of what is the historical California context for environmental education and what will the future bring?

California's Environmental Principles and Concepts

California, beginning with AB 1548, approved in 2003 by Governor Schwarzenegger, an environmental education strategy for K-12 public education was legislated. This bill is responsible for the directive to develop California's Environmental Principles and Concepts (CA EP&Cs) and the directive to develop model curriculum to teach these ideas. See Figure 3 for the five principles and the concepts within each of them.

Figure 3

California's Environmental Principles and Concepts

Principle 1 - People Depend on Natural Systems	<i>The continuation and health of individual human lives and of human communities and societies depend on the health of the natural systems that provide essential goods and ecosystem services.</i>	Concept A. The goods produced by natural systems are essential to human life and to the functioning of our economies and cultures.
		Concept B. The ecosystem services provided by natural systems are essential to human life and to the functioning of our economies and cultures.
		Concept C. That the quality, quantity, and reliability of the goods and ecosystem services provided by natural systems are directly affected by the health of those systems.
Principle 2 - People Influence Natural Systems	<i>The long-term functioning and health of terrestrial, freshwater, coastal, and marine ecosystems are influenced by their relationships with human societies.</i>	Concept A. Direct and indirect changes to natural systems due to the growth of human populations and their consumption rates influence the geographic extent, composition, biological diversity, and viability of natural systems.
		Concept B. Methods used to extract, harvest, transport, and consume natural resources influence the geographic extent, composition, biological diversity, and viability of natural systems.
		Concept C. The expansion and operation of human communities influences the geographic extent, composition, biological diversity, and viability of natural systems.
		Concept D. The legal, economic, and political systems that govern the use and management of natural systems directly influence the geographic extent, composition, biological diversity, and viability of natural systems.

Figure 3 (continued)*California's Environmental Principles and Concepts*

Principle 3 - Natural Systems Change in Ways that People Benefit From and Can Influence	<i>Natural systems proceed through cycles that humans depend upon, benefit from, and can alter.</i>	Concept A. Natural systems proceed through cycles and processes that are required for their functioning.
		Concept B. Human practices depend upon and benefit from the cycles and processes that operate within natural systems.
		Concept C. Human practices can alter the cycles and processes that operate within natural systems.
Principle 4- There are no Permanent or Impermeable Boundaries that Prevent Matter from Flowing Between Systems	<i>The exchange of matter between natural systems and human societies affects the long-term functioning of both.</i>	Concept A. The effects of human activities on natural systems are directly related to the quantities of resources consumed and to the quantity and characteristics of the resulting byproducts.
		Concept B. The byproducts of human activity are not readily prevented from entering natural systems and may be beneficial, neutral, or detrimental in their effect.
		Concept C. The capacity of natural systems to adjust to human-caused alterations depends on the nature of the system as well as the scope, scale, and duration of the activity and the nature of its byproducts.
Principle 5 - Decisions Affecting Resources and Natural Systems are Complex and Involve Many Factors	<i>Decisions affecting resources and natural systems are based on a wide range of considerations and decision-making processes.</i>	Concept A. There is a spectrum of what is considered in making decisions about resources and natural systems and how those factors influence decisions.
		Concept B. The process of making decisions about resources and natural systems, and how the assessment of social, economic, political, and environmental factors has changed over time.

The Energy and the Environment Initiative (EEI) curriculum was developed and approved by the California State Board of Education and made free to teachers in California. This served as model curriculum that could be used in science and history/social science classrooms for K-12 education in California to address environmental literacy. Then in 2015, A

Blueprint for Environmental Literacy (ABEL) was developed by the Environmental Literacy Task Force which was reviewed and supported by the California Department of Education.

ABEL defined environmental literacy as follows:

An environmentally literate person has the capacity to act individually and with others to support ecologically sound, economically prosperous, and equitable communities for present and future generations. Through lived experiences and education programs that include classroom-based lessons, experiential education, and outdoor learning, students will become environmentally literate, developing the knowledge, skills, and understanding of environmental principles to analyze environmental issues and make informed decisions. (p. 5)

In addition, ABEL (2015) outlined several overarching strategies including “Systematically integrate environmental literacy concepts into statewide educational priorities, including new academic standards, new and revised curriculum frameworks, state-adopted textbooks and learning materials, professional learning programs, and the emerging new state accountability and assessment systems.” In (2018), Senate Bill 720 Codified the CA EP&Cs into California Ed. Code requiring the CA EP&Cs “be integrated into the content standards and curriculum frameworks in the subjects of English language arts, science, history-social science, health, and to the extent practicable, mathematics whenever those standards and frameworks are revised” (SB 720). In recent years, California’s State Board of Education has included CA’s EP&Cs into CA’s Science Framework (2016), History Social Science Framework (2016), Health Framework (2019), and Arts Framework (2020). “The environmental principles and concepts identified pursuant to paragraph (1) are, therefore, fundamental to the definition of environmental literacy in California...” (SB 720, 2018).

Unfortunately, as noted in ABEL (2015), “K-12 students in California do not currently have consistent access to adequately funded, high-quality learning experiences, in and out of the classroom, that build environmental literacy.” The landscape for environmental education opportunities in California is limited and inequitable. 520 California principals surveyed reported that “only 13% had successfully integrated environmental education into their curricula” (ABEL, 2015) Despite the legislation recommending Local Education Agencies within California to implement CA’s EP&Cs and providing free model curriculum to do so, many K-12 students still do not receive access to these environmental literacy standards. The COVID-19 pandemic has exacerbated these issues. In Lawrence Hall of Science’s (2020) report, the estimated losses to the field of outdoor education are devastating. If outdoor education and environmental literacy organizations that have been closed due to the COVID-19 pandemic are unable to open for the duration of the 2020/2021 school year more than 11 million students will have missed learning opportunities.

Environmental Education Teacher Efficacy Belief

Teacher Self-Efficacy

In order to gain insight into the implementation of environmental literacy, and more specifically, CA EP&Cs by California K-12 teachers, we must understand why and how teachers make choices to engage in different aspects of teaching. Albert Bandura played a foundational role in developing the idea of self-efficacy, a concept that stems from Social Cognitive Theory. Bandura (1977) explains that perceived self-efficacy can influence choice of activities, coping efforts needed to accomplish activities, and the effort and duration that people will spend towards accomplishing an activity. Bandura (2004, p. 79) states “Unless people believe they can produce the desired effects by their actions, they have little incentive to persevere in the face of

difficulty.” Bandura’s work is central to the application of self-efficacy in education known as teacher self-efficacy.

Personal Teaching Efficacy and General Teaching Efficacy

Teacher-self efficacy is an important construct in teacher education and this concept relates human agency to a sense of self-efficacy (Cantrell, Young, Moore, 2003; Gibson & Dembo, 1984; Goddard, Hoy, & Woolfolk Hoy, 2000). Teacher self-efficacy can be further delineated into Personal Teaching Efficacy (PTE) and General Teaching Efficacy (GTE) “Teachers with a high level of Personal Teaching Efficacy have confidence that they have adequate training or experience to develop strategies for overcoming obstacles to student learning” (Cantrell et. al., 2003, p. 177). Whereas PTE is associated with a personal belief that a teacher is competent in a given situation, GTE is more associated with a person’s view about teachers in general. For example, “Teachers with low GTE may believe that a teacher really cannot do much about a student’s motivation and performance because of the influence of home environment” (Cantrell et. al., 2003, p. 177). Therefore, it can be inferred that if a teacher has high PTE and GTE, “teachers who believe student learning can be influenced by effective teaching (GTE) and who also have confidence in their own teaching ability (PTE) should persist longer, provide greater academic focus in the classroom, and exhibit different types of feedback” (Gibson & Dembo, 1984, p. 570).

Science Teaching Efficacy Belief Instrument

The concept of teacher self-efficacy can be applied to specific disciplines within the field of teaching. This has led to a variety of teaching belief instruments developed with the purpose of measuring teacher self-efficacy for specific disciplines. In 1989, Riggs and Enochs developed the Science Teaching Efficacy Belief Instrument (STEBI) to measure the teaching-efficacy of in-

service science teachers. Their purpose for developing the STEBI was to create an instrument that would measure science teacher self-efficacy for elementary science teachers because of their concern that elementary teachers do not teach science as a high priority (Riggs & Enochs, 1989). Then they developed the STEBI-B, a very similar instrument, but with the distinction that it was used to measure the science teacher self-efficacy of preservice teachers. The only difference between the STEBI and the STEBI-B is the shift from present tense to future tense because the STEBI-B implies that the preservice teachers have not begun teaching in the classroom. The STEBI has two dimensions of teacher self-efficacy: teaching efficacy outcome expectancy (TEOE) and personal teaching efficacy also known as self-efficacy (PTE). Factor analysis calling for two factors, Personal Science Teaching Efficacy Belief (PSTEB) and Science Teaching Outcome Expectancy (STOE), was run on the STEBI with PSTEB having an eigenvalue of 6.26 and STOE having an eigenvalue of 2.71. Riggs and Enochs (1998) concluded that the “STEBI is a valid and reliable tool for studying elementary teacher’s beliefs toward science teaching and learning”.

Variations of the STEBI (STEBI-CHEM, MTEBI, EEEBI) were then created by researchers to apply this instrument to a variety of disciplines including math, chemistry, environmental science, and others. In most of these instances, the substitution of “science teaching” for the discipline specific type of science within the instrument was made, i.e., “chemistry teaching” (Moseley et al., 2016).

Environmental Education Teacher Efficacy Belief Instrument

In (2016) Moseley, Angle, Utley & Mwavita developed the Environmental Education Teacher Efficacy Belief Instrument (EETEBI) in order to measure the environmental education teacher efficacy beliefs of preservice teachers. The EETEBI is a modification of the STEBI-B,

but Moseley et al. deemed it inadequate in this instance to simply replace “science teacher” with “environmental education teacher”. Upon reviewing the *Guidelines for the Preparation of Professional Development of Environmental Educators* (NAAEE, 2010) revealing themes that specifically address environmental education outcome expectancy and environmental education teaching efficacy influenced Moseley et. al to make further modifications from the STEBI. Another significant change was shifting to a 6-point Likert scale from a 5-point Likert scale by removing the neutral choice.

Factor analysis on the EETEBI revealed that the 20 items on the instrument were a good fit for a two-factor structure and that the two factors were consistent with the two factors from the STEBI. In this case the two factors within the construct are labeled Environmental Education Outcome Expectancy (EEOE) and Personal Environmental Education Teaching Efficacy (PEETE). The reliability of the PEETE scale had a Cronbach’s alpha of .92 and the reliability of the EEOE scale was an acceptable .76 (Moseley et al., 2016).

Classroom teachers play a critical role in promoting environmental literacy. Morris and Schagen (1996, p. 20) argue that “it is the beliefs and practices of environmentally motivated teachers which are the most significant elements in promoting young people to undertake environmental action”. Furthermore, teachers who harbor negative attitudes towards science are likely to pass these attitudes onto their students (Mason, Kahle, & Gardner, 1991). Findings such as these give relevance to the importance of measuring the environmental education teacher self-efficacy of teachers who implement environmental literacy curriculum (Moseley et. al (2016). The results of the EETEBI, when shared with teachers, can serve as a reflective tool to help teachers understand their self-efficacy and to engage with professional learning to address their instructional deficits.

Environmental Identity

Individual Identity

Erikson (1968) defined individual identity in terms of a feeling of sameness and continuity across time. He also adds that identity develops continually throughout one's lifespan. "Identity is fundamentally a way of defining, describing, and locating oneself. People have multiple identities that can vary in salience and significance over a lifetime and across different contexts" (Clayton 2012, p. 165). Clayton (2003) defines environmental identity (EI) as "a sense of connection to some part of the nonhuman natural environment that affects the way we perceive and act toward the world: a belief that the environment is important to us and an important part of who we are" (pp. 45-46). This construct is significant because identity can determine whether or not we accept information and what actions we may take with that information (Krasny, 2020). People with high EI are correlated with more concern directed toward environmental topics and is associated with pro-environmental behavior. (Prevot, Clayton & Mathevet, 2018). However, a significant predictor of concern among environmental educators is determined by the amount outdoor experience they have as children. (Palmer, 1993)

Teacher Environmental Identity

In the literature there have been few studies regarding the EI of in-service teachers. Most studies focus on the EI of pre-service teachers and the development of EI in students by teachers, but not on the EI of in-service teachers themselves. Clayton (2003) finds that teachers can support the development of their student's EI by addressing misconceptions and building on personal experience in the classroom. Pektas (2020) asserts that the EI of prospective teachers is an important source of power for adults of future generations facing environmental challenges. In a study involving 644 college students in Turkey, Pektas found that there is a significant

difference of higher EI for prospective teachers who have a rural place of residence as compared to an urban place of residence.

What is not found in the literature is what does EI mean for teachers and their implementation of environmental literacy? Are teachers with high EI likely to have high personal environmental education teacher efficacy? Are they more likely to implement the CA EP&Cs and help students increase their environmental literacy? These questions have not been explored in the body of research.

Clayton's Environmental Identity Scale

To measure the level of a teacher's EI, we will be using Clayton's Environmental Identity Scale (EID). Olivos and Aragonés (2011, p. 68) conducted Psychometric analysis on EID. They report that "The EID achieves a high level of internal consistency ($\alpha = .90$)". Five factors were determined by Olivos and Aragonés' exploratory factor analysis on EID, each having eigenvalues greater than 1 and alpha values of at least .7. However, one factor was omitted due to the fact that there was only one question associated with this factor in the EID instrument. The four remaining factors are as follows: environmental identity, enjoying nature, appreciation of nature, and environmentalism. The high level of internal consistency confirms the reliability of the scale.

Concerns-Based Adoption Model (CBAM)

Background Information

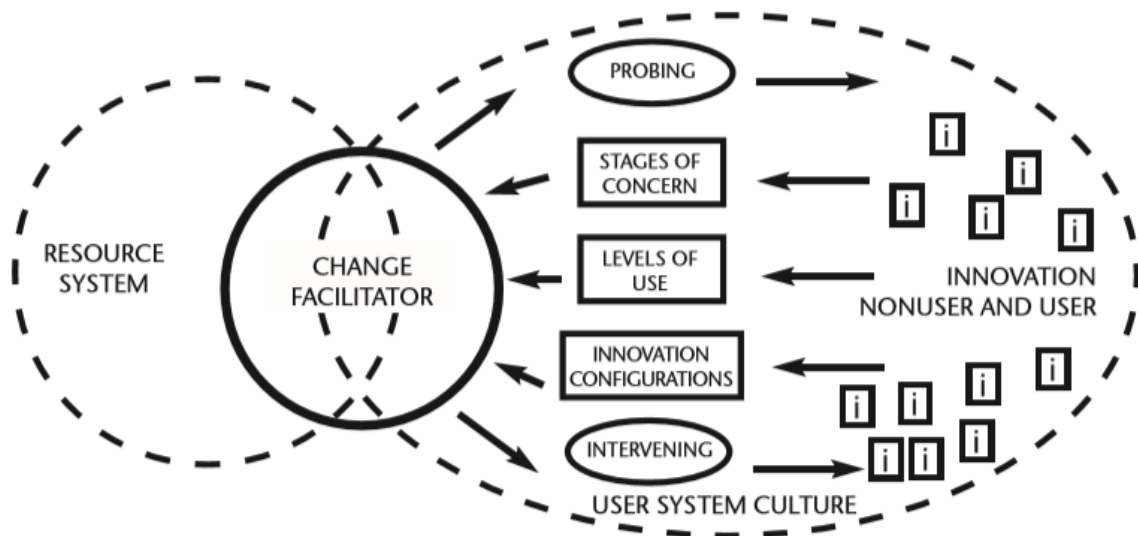
The conceptual framework in this study involves the Concerns-Based Adoption Model (CBAM) developed by Hall in 1973, but it is not CBAM in its entirety; CBAM makes up only a part of the conceptual framework used in the study. CBAM has been used to better understand and measure the implementation of an innovation while offering deeper insight into the adoption

process. Hord, Rutherford, Huling-Austin, and Hall (1997) astutely point out that just because an innovation has been introduced to teachers and an initial training has been conducted does not mean that said innovation will then be implemented equally by teachers. Hord et. al, (1997) verified 6 assumptions that founded the CBAM model:

1. Change is a process, not an event.
2. Change is accomplished by individuals.
3. Change is a highly personal experience.
4. Change involves developmental growth.
5. Change is best understood in operational terms.
6. The focus of facilitation should be on individuals, innovations, and the context.

From these assumptions, it is clear that the CBAM model considers that the individual being asked to implement the innovation will have varying challenges and experiences that affect the implementation.

The CBAM Model (see Figure 4) has various components to consider. A change facilitator using a resource system is navigating the stages of concern, levels of use, and innovation configurations of the users and nonusers of the innovation. In this study's particular case, the innovation is the teaching of the CA EP&Cs, and the resource system is the various curriculum addressing California's EP&Cs as well as the educational frameworks that provide guidance to teachers on how to implement them. The change facilitator is the person that is helping to facilitate the implementation of the innovation. In the CBAM model they use three diagnostic tools to help provide evidence of the implementation, Stages of Concern, Levels of Use, and Innovation Configurations.

Figure 4*The CBAM Model***Stages of Concern**

The stages of concern (SOC) element of the CBAM model probes into the concerns of the user of the innovation and breaks the concern down into 7 different stages. They are as shown in Figure 5 and further explained in Figure 6.

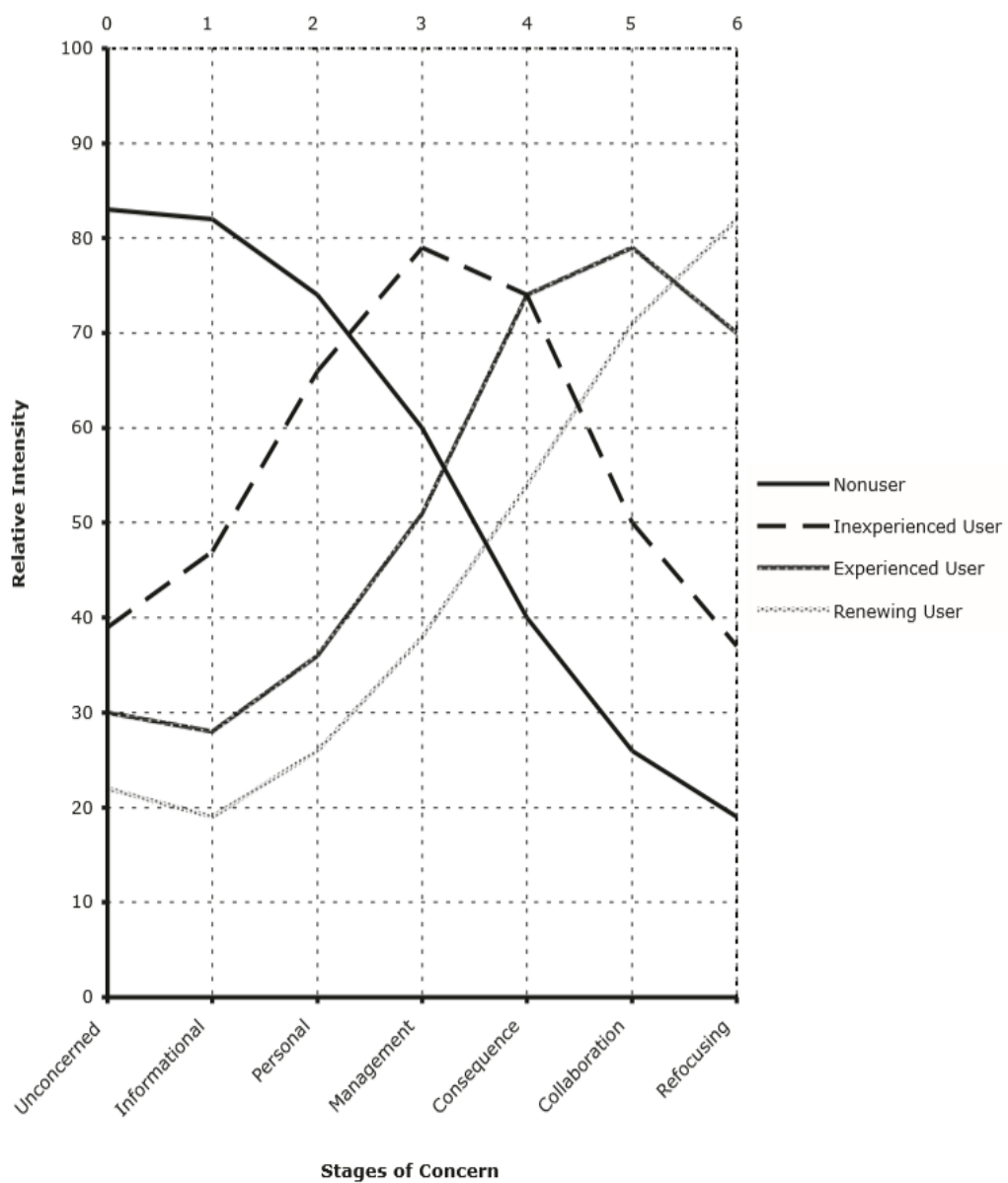
Figure 5*The Stages of Concern about an Innovation*

IMPACT	6	Refocusing	The individual focuses on exploring ways to reap more universal benefits from the innovation, including the possibility of making major changes to it or replacing it with a more powerful alternative.
	5	Collaboration	The individual focuses on coordinating and cooperating with others regarding use of the innovation.
	4	Consequence	The individual focuses on the innovation's impact on students in his or her immediate sphere of influence. Considerations include the relevance of the innovation for students; the evaluation of student outcomes, including performance and competencies; and the changes needed to improve student outcomes.
TASK	3	Management	The individual focuses on the processes and tasks of using the innovation and the best use of information and resources. Issues related to efficiency, organizing, managing, and scheduling dominate.
SELF	2	Personal	The individual is uncertain about the demands of the innovation, his or her adequacy to meet those demands, and/or his or her role with the innovation. The individual is analyzing his or her relationship to the reward structure of the organization, determining his or her part in decision making, and considering potential conflicts with existing structures or personal commitment. Concerns also might involve the financial or status implications of the program for the individual and his or her colleagues.
	1	Informational	The individual indicates a general awareness of the innovation and interest in learning more details about it. The individual does not seem to be worried about himself or herself in relation to the innovation. Any interest is in impersonal, substantive aspects of the innovation, such as its general characteristics, effects, and requirements for use.
	0	Unconcerned	The individual indicates little concern about or involvement with the innovation.

Figure 6*Typical Expressions of Concern About an Innovation*

Stages of Concern		Expressions of Concern
"Impact"	6	I have some ideas about something that would work even better.
	5	I would like to coordinate my effort with others, to maximize the innovation's effect.
	4	How is my use affecting my students?
"Task"	3	I seem to be spending all my time getting materials ready.
"Self"	2	How will using it affect me?
	1	I would like to know more about it.
"Unconcerned"	0	I am not concerned about it.

The Stages of Concern Questionnaire (SOCQ) can be used to determine the stage of concern for the user (George et. al., 2006). A profile of concern for each user of the innovation can be determined. Based on the profile, and more simply on the peak stage of concern (SOC), a determination can be made on the type of user. Figure 7 makes the connection between concern profile and whether the user is a nonuser, an inexperienced user, an experienced user, or a renewing user. This provides insight into the level of implementation of the innovation by the user. The stage of concern is most directly related to the feeling or emotions associated with implementation of the innovation (George et. al., 2006).

Figure 7*Hypothesized Development of Stages of Concern*

Conclusion of Literature Review

Many studies, both quantitatively and qualitatively have been conducted on the Concerns-Based Adoption Model, however none have been conducted on the implementation of California's EP&Cs. Furthermore, this literature review presents several studies in regard to environmental identity (most dealing with pre-service teachers) and environmental education teacher efficacy belief. There has not been a study conducted that incorporates the concerns-based adoption model to determine how the concern for implementation of California's EP&Cs is associated with the environmental identity and personal environmental education teacher efficacy of in-service teachers. The environmental challenges that are facing California, the United States, and countries throughout the world are vast and significant. They require environmentally literate people to engage in the systems of the world to address these challenges. In-service teachers are an important part of that future and providing professional learning to them, so they have the Personal Environmental Education Teacher Efficacy, Environmental Identity, and appropriate concern to implement environmental literacy standards, is critical. Determining the associations between EI, PEETE, and the concern for teaching CAs EP&Cs is a necessary step towards a more sustainable and environmentally literate future.

CHAPTER 3: METHODS

Combining elements of quantitative and qualitative data collection and analysis techniques, a mixed methods approach was utilized in this study. For the quantitative aspects of the study a non-experimental approach with a correlational design was used. For the qualitative aspects of the study an embedded case study design was used.

For the quantitative analysis, levels of environmental identity (EI), personal environmental education teacher efficacy (PEETE) – a subscale of Environmental Education Teacher Efficacy Belief (EETEB), and peak Stage of Concern (SOC) for implementing CA Environmental Principles and Concepts (CA EP&Cs) were determined for participating teachers. Then, Pearson Correlation analysis was used to find relationships between the teacher levels of Environmental Identity (EI), Personal Environmental Education Teacher Efficacy (PEETE), and the peak Stage of Concern (SOC) involved in the implementation of California's Environmental Principles and Concepts (EP&C's). It should be noted that causation between these variables cannot be determined in this study, and the analysis and methodology at best can only yield relationships between the variables. Thus, results from the correlational design may tentatively suggest possible factors that ultimately impact implementation of California's EP&C's.

Then, a closer look was taken by conducting follow-up interviews (see Appendix B for follow-up interview protocol) on 5 of the participants. The qualitative approach used was borrowed from the tradition of case study and specifically uses an embedded case study design. The bounded system for the case study was defined as teacher participants involved in one of five California Environmental Literacy Project (CELP) programs that agreed to follow-up interviews, and the subunits embedded within the single case are each of those five individual

teachers. The participant responses from the follow-up interviews were analyzed using a constant comparative method to analyze within-case themes occurring across the subunits of the case.

Participants

Target population

The target population for this study were K-12 in-service teachers from California who were attending one of five CELP programs engaged in professional learning on the implementation of California's Environmental Principles and Concepts (CA EP&Cs). The CA EP&Cs are environmental literacy standards that are specific to California. Therefore, it was imperative that the participants were teachers that were teaching within the state of California during CELP program activity.

Accessible population

The accessible population for this study consists of teachers that were participating in any of the five California Environmental Literacy Project (CELP) programs funded by the California Department of Education (CDE). The CELP programs were active in California between the years of 2019 to 2022. The five County Office of Education's (COE) receiving CELP funding to conduct regional CELP programs are geographically located in the following counties: Contra Costa County, Humboldt County, San Diego County, San Joaquin County, and Santa Cruz County (see Figure 8).

Figure 8

Participating County Offices of Education in the CELP Program.

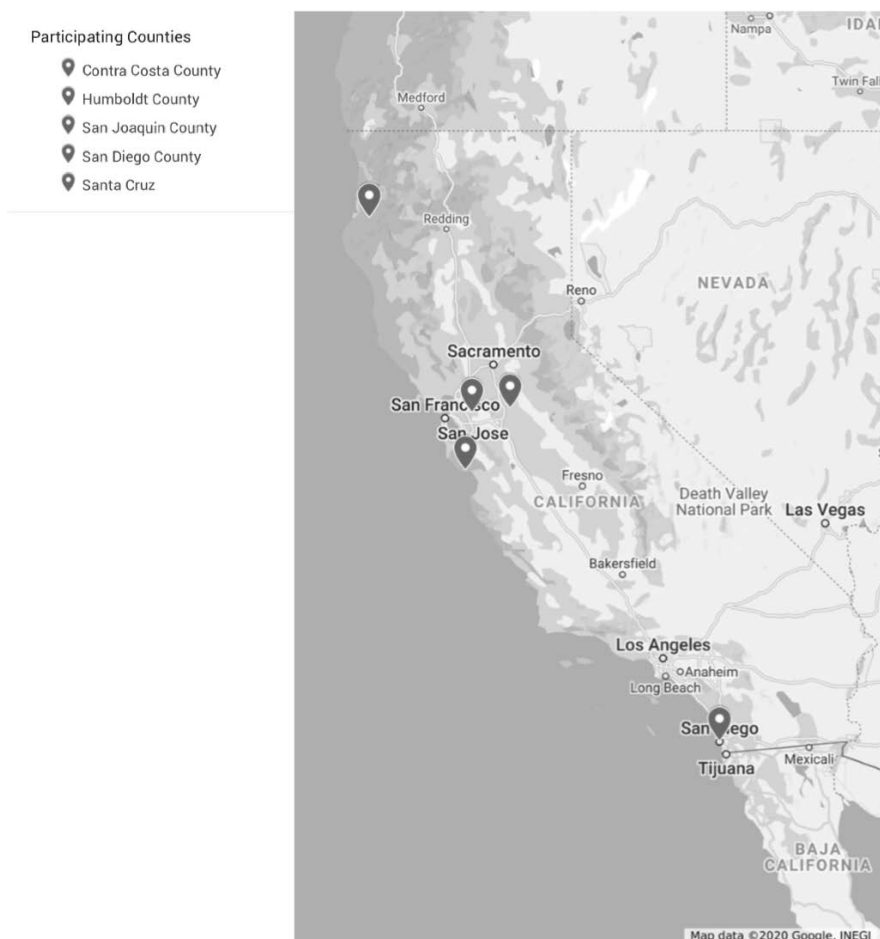


Table 1, Summary of the 5 CELP Programs, provides details of overall characteristics of each CELP program. Humboldt COE's CELP program involved 51 K-12 in-service teachers representing a mostly rural region of California in a project that was geared to leveraging environmental, place-based learning experiences. Contra Costa COE's CELP program was focused on providing six 4th and 5th grade teachers with hands-on, phenomenon-based professional learning to develop outside learning experiences within their classrooms. These teachers represent a mostly suburban region of California. The San Diego COE CELP program

was focused on providing teachers with professional learning and resources related to environmental literacy. Fifty teachers were directly involved in receiving the professional learning from mostly urban settings and the website that houses their environmental literacy resources has been accessed over 1900 times in 2018 when data was collected on the analytics of the resource website. In San Joaquin County's CELP program, 60 K-12 in-service teachers were provided professional learning regarding the implementation of California's EP&Cs with a focus on utilizing the local schoolyard for outdoor learning, nature journaling, and including local environmental phenomena in lesson sequences. These teachers represent a suburban region of California. Finally, in Santa Cruz COE's CELP program, 56 K-12 in-service teachers participated in a 5-day professional learning program with 10 mentor teachers and 20 local environmental education partners focused on integrating environmental literacy with their Next Generation Science Standards (NGSS) implementation. These teachers represent a suburban and urban subsection of California. In total, approximately 223 in-service K-12 teachers were participating in the CELP projects statewide at the time the study was conducted.

Table 1*Summary of the 5 CELP Programs*

County	Number of Participants	Setting	Grade Levels of Teachers Involved	Focus
Contra Costa	6	Suburban	4-5	Developing Outside Learning Experiences
Humboldt	51	Rural	K-12	Leveraging place-based learning experiences
San Diego	50	Urban	K-12	Providing Environmental Literacy Resources to region
San Joaquin	60	Suburban	K-12	Including outdoor learning, nature journaling, climate change science in lessons
Santa Cruz	56	Suburban	K-12	Integrating Environmental Literacy within NGSS lesson sequences.

It is important to note that most teachers who participated in this study came from the San Joaquin County Office of Education's regional CELP program. However, due to the anonymity of the participation in the survey it is unknown exactly what percentage of teachers participated from each of the 5 CELP programs. It is known that for the five teachers participating in follow-up interviews, 3 attended the San Joaquin County Office of Education CELP, 1 attended the Santa Cruz County Office of Education CELP program, and 1 attended the San Diego County Office of education CELP program.

Instrumentation

The instrumentation that will be used for this study combines Clayton's (2003) Environmental Identity Scale (EID), Moseley, Angle, Utley & Mwavita's (2016) Environmental Education Teacher Efficacy Belief Instrument (EETEBI), Hall's (1987, 2006) Stages of Concern Questionnaire from the Concern's Based Adoption Model, and a researcher-created demographic questionnaire. In addition, a researcher-created follow-up interview protocol will be used for a

subset of the participants. A review of the variables that make up each construct along with evidence concerning each instrument's validity and reliability is provided.

Demographic Questionnaire

The demographic component of the survey will include questions regarding gender, age, teaching experience, overall education, level of formal science education, current teaching position, self-reported science instructional time per week, information about specific school site that teachers work, and potential barriers that may prevent the teaching of California's EP&Cs. Questions regarding the duration of each teachers' involvement in their local CELP program will be collected as well.

Environmental Identity Scale

To measure each teacher's environmental identity, we will be using Clayton's Environmental Identity Scale (EID). Olivos and Aragonés (2011) conducted a psychometric analysis of the EID. They report that "The EID achieves a high level of internal consistency ($\alpha = .90$)" (p. 68). Five factors were found by Olivos and Aragonés via exploratory factor analysis, each having eigenvalues greater than 1 and alpha reliabilities of at least .70. However, one factor was omitted due to the fact that there was only one question associated with this factor. The four remaining factors are as follows: environmental identity, enjoying nature, appreciation of nature, and environmentalism. The high level of internal consistency ($\alpha = .90$) confirms the reliability of the scale's composite score, which will be used in this study.

In addition to the factorial validity evidence for the EID, the subscales of this measure are positively and significantly correlated with measures of connectedness to nature, ego-biocentrism, and pro-environmental behavior (Olivos and Aragonés, 2011). This provides additional construct validity evidence for this instrument.

A short form of the EID scale has been developed by Clayton with only 11 items pertaining to two factors: sense of connection to the natural world and importance of the natural world to the individual (Clayton, 2012). The internal consistency of this shortened form has a Cronbach's alpha of .91. Clayton uses the overall scale as a unidimensional measure in her study to validate a measure of climate change anxiety. A composite score based on all items of the EID will be used in this study as well; however, it will be based on the full 24-item instrument.

Environmental Education Teacher Efficacy Belief Instrument

The Environmental Education Teacher Efficacy Belief Instrument (EETEBI) was developed by Moseley and colleagues (Moseley et al., 2016) using standard measurement criteria for analyzing validity (face, content, and construct) and reliability (Cronbach's alpha). Modification of the Science Teacher Efficacy Belief Instrument - B (STEBI-B) was used to create the EETEBI, resulting in several significant differences from the STEBI-B (Moseley et al., 2016). The EETEBI uses a 6-point Likert scale as opposed to the STEBI-B's 5-point scale to eliminate the neutral choice. Additionally, instead of simply replacing the word "science" from the STEBI-B with "environmental science", Moseley and colleagues recognized the multidisciplinary nature of environmental education and reworded items from the STEBI-B "to more closely align with the teaching of environmental education" (Moseley et al., 2016, p. 392). Exploratory factor analysis reduced the instrument to 20 items with a strong fit for a two-factor structure. The two factors (outcome expectancy and personal teaching efficacy) are consistent with the two factors that are the basis for the STEBI-B; specifically, for the EETEBI the factors are Environmental Education Outcome Expectancy (EEOE) and Personal Environmental Education Teaching Efficacy (PEETE). The reliability of the PEETE scale had a Cronbach's alpha of .92 and the reliability of the EEOE scale was an acceptable .77 (Moseley et al., 2016)

Stages of Concern Questionnaire

The Stages of Concern construct was a component of the Concerns Based Adoption Model developed by Hall, Wallace, and Dossett (1973). There are 7 Stages of Concern beginning with level 0, “Unconcerned”, level 1 and 2, “Self-concerned”, level 3 “Task-concerned”, and level 4, 5 and 6, “Impact-concerned.” To measure these various stages of concern, a Stages of Concern Questionnaire (SOCQ) was developed. In 1974 a pilot instrument was distributed to teachers and college faculty of various years of experience utilizing the innovation of teaming in elementary schools and the use of instructional modules in colleges (George et al., 2006). Questionnaires were returned from 363 instructors and item correlation factor analysis was performed indicating that seven factors present within the scale. Various studies have been conducted to determine the internal reliability of each stage within the SOCQ. Figure 9 shows a table of the findings from these studies.

Figure 9

Coefficients of Internal Reliability, Cronbach's alpha, for Each Stage of the Concerns Questionnaire

		Stages of Concern						
Authors	Sample Size	0	1	2	3	4	5	6
Hall, George, & Rutherford, 1979	830	.64	.78	.83	.75	.76	.82	.71
Van den Berg, & Vandenberghe, 1981	1585	.77	.79	.86	.80	.84	.80	.76/ 73*
Kolb, 1983	718	.75	.87	.72	.84	.79	.81	.82
Barucky, 1984	614	.60	.74	.81	.79	.81	.79	.72
Jordan-Marsh, 1985	214	.50	.78	.77	.82	.77	.81	.65
Martin, 1989	388	.78	.78	.73	.65	.71/ 78*	.83	.76
Hall, Newlove, Rutherford, & Hord, 1991	750	.63	.86	.65	.73	.74	.79	.81
* In these studies, the authors proposed two subscales in place of the original SoC scale.								

Follow-up Interview Protocol

A follow-up interview was conducted for the five participants who agreed to be interviewed after the environmental literacy education questionnaire was conducted. The sampling used for follow-up interviews was convenience sampling as the low number of participants agreeing for follow-up interviews did not allow for more advanced sampling methods to be employed.

Below is the follow-up interview protocol used in the study.

1. What is your current teaching position for the 2022/2023 school year? How has it changed from when you were participating in the CELP program in the 2020/2021 school year?

2. Would you like to share anything about your identity, how you would describe yourself?
3. Another area that some folks see themselves connected with is the environment. If that is a part of your identity, please describe your "environmental identity."
4. Suppose a fellow teacher at your site came to you wanting information on the California Environmental Principles and Concepts also known as the California EP&Cs. How would you describe what the CA EP&Cs are to that teacher? What would you emphasize? Are there any resources you would suggest they consult for more information, beyond what you might be able to provide?
5. What were some challenges or concerns you've encountered when teaching the CA EP&Cs?
6. What motivated you to want to participate in the CELP program?
7. In what ways, if any, did your participation in the CELP program affect your environmental identity as a teacher?
8. In what ways, if any, do you feel as though your confidence in teaching about the environment were influenced by your participation in the CELP program? Which aspects do you feel more confident and less confident about?
9. In what ways, if any, did your participation in the CELP program affect your abilities to implement the CA EP&Cs in your classroom?
10. For you as a teacher, do you see any connections between your environmental identity, self-efficacy of teaching about the environment, and your implementation of CA EP&Cs in your classroom? If so, what connections or associations do you see?

11. Is there anything else that you would like to share about your environmental identity, self-efficacy of teaching about the environment or your implementation of CA EP&Cs in your classroom that I have not asked about?

Procedure

In the third and final year of the CELP program implementation and upon receiving IRB approval, I requested a list of active participants from the four other directors of the California Environmental Literacy Project (CELP) programs. After receiving these lists of in-service K-12 teachers I emailed the letter of consent, and the full ELEQ survey containing the EID, EETEBI, and SOCQ along with demographic questions (see Appendix B) directly to the participating teachers in all five CELP programs and included the directors of the other CELP programs in the email sent out to their participants. In addition, they received information regarding the nature of the study and a statement verifying my commitment to protecting the anonymity of each participant. I sent an additional reminder email to the participants of the CELP programs after one week from the initial request to solicit a higher response rate to my request. The ELEQ included a question asking participants that if they were willing to participate in a follow-up interview to continue onto an additional survey (link was provided) where the participant could provide their email so that I could arrange for a follow-up interview. This separated their identity (i.e., the email address) from their survey responses to ensure anonymity.

Approximately eighteen months after the completion of the final year of the CELP programs, follow-up interviews were conducted for five of the participating CELP teachers. To maintain anonymity, I employed an alphanumerical identifier with all participants who completed the ELEQ. This allowed all responses from the ELEQ to remain anonymous and for only the five participants agreeing to follow-up interviews to provide their email address. This

allowed me to connect responses from the anonymous ELEQ with those who were willing to participate in follow-up interviews.

Methods for Data Analysis

The research questions are as shown in Table 2. The method that was used to analyze survey data to answer each of the five research questions are listed. Details surrounding the analysis of each of the research questions are discussed below.

Part 1 – The Big Picture

Research Question 1, 2, and 3

Research Questions 1, 2, and 3 were analyzed using a frequency distribution. The EID, EETEBI, and SOCQ survey data from each participant was scored. This produced a value for EI, a value from the PEETE – a subscale of the EETEB, and a peak SOC for each participant. The frequency distribution was reported for each of these three variables.

Research Question 4

Research Question 4 was addressed by listing the self-reported concerns that teachers have provided from the Environmental Literacy Education Questionnaire. The constant comparative method was used to identify the common themes that emerged from participant responses.

Table 2

Method of Data Analysis used to Answer Each Research Question

Research Question	Type of Research Methodology	Method of Data Analysis
1. What is the level of Environmental Identity (EI) of teachers who participate in California Environmental Literacy Project (CELP) programs?	Quantitative	Descriptive statistics – Frequency distribution.
2. What is the level of Personal Environmental Education Teacher Efficacy (PEETE) of teachers who participate in CELP programs?	Quantitative	Descriptive statistics – Frequency distribution.
3. What is the peak Stage of Concern (SOC) of implementing CA EP&Cs for teachers who participate in CELP programs?	Quantitative	Descriptive statistics – Frequency distribution.
4. What potential barriers and/or concerns do teachers who participate in CELP programs report for the implementation of CA EP&Cs?	Qualitative	Within-case study theme analysis using constant comparative method.
5. Is there an association between the levels of EI and PEETE for teachers who participate in CELP programs?	Quantitative	Descriptive statistics – Scatterplot and Pearson correlation
6. Is the stage of concern for implementation of California's Environmental Principles & Concepts (EP&Cs) associated with the level of EI for teachers who participate in CELP programs?	Quantitative	Descriptive statistics – Scatterplot and Pearson correlation

Table 2 (continued)

7. Is the stage of concern for implementation of California's EP&Cs associated with the level of PEETE for teachers who participate in CELP programs?	Quantitative	Descriptive statistics – Scatterplot and Pearson correlation
8. Who are the teachers participating in follow-up interviews?	Qualitative	Within-case study theme analysis using constant comparative method.
9. How do these teachers describe themselves in the context of teaching environmental literacy?	Qualitative	Within-case study theme analysis using constant comparative method.
10. How do these teachers feel their participation in the CELP program affected their teaching of environmental literacy?	Qualitative	Within-case study theme analysis using constant comparative method.

Research Question 5

Research question 5 was analyzed using a Pearson Correlation Test correlating the EI and EETEB of all participants. The results were included as a table containing a single correlation. The sign and magnitude of the correlation coefficient, the sample size on which it is based, and the significance level was reported.

Research Question 6 and 7

For research question 6 the level of EI was correlated to peak SOC. Similarly, for research question 7, the level of PEETE was correlated to peak SOC for the participants. The sign and magnitude of the correlation coefficient, the sample size on which it is based, and the significance level was reported.

Part 2 – A Closer Look

Research Question 8, 9, and 10

Research questions 8, 9, and 10 was analyzed using the qualitative analysis borrowing from the tradition of case study. The unit of study for this part of the research was the 5 participants who were willing to provide follow-up interviews. The responses from the interview were analyzed by using within case theme analysis using the constant comparative method. Themes pertaining to their environmental identity, environmental education teacher efficacy belief, concern for implementing California's EP&Cs, and how the CELP program may have affected these relationships emerged from the analysis.

Positionality of the Researcher

In general, one of my professional goals as previous coordinator of environmental literacy and outdoor education was to determine what factors affect the implementation of California's EP&Cs by teachers. It should be noted that at the time of the study I was one of the 5 directors for the CELP programs in California. I had established myself as the lead facilitator of professional learning regarding the implementation of California's EP&Cs with the teachers participating in the San Joaquin COE instance of the CELP program. They were aware that I was conducting research on the relationships between Environmental Identity, Personal Environmental Education Teacher Efficacy, and the concern for implementation of CA EP&Cs. It is possible that this may have influenced their survey results. To help resolve this, I asked all of the participants to answer the survey questions honestly. Participants were aware that their responses would be anonymous and that other CELP participants would also be providing data for this study.

Chapter Summary

In summary, IRB approval to conduct this study with 72 in-service teacher participants within CELP programs across the state of California, was received. The researcher-made survey, Environmental Literacy Education Questionnaire, seeking demographic data, containing open-ended questions on the barriers and challenges of teaching CA EP&Cs, along with three measures: Environmental Identity Scale, Environmental Education Teacher Efficacy Belief Instrument, and the Stages of Concern Questionnaire was administered in the third year and final year of the CELP programs. Then, descriptive statistical techniques of frequency analysis and Pearson correlations were performed to determine the associations between the overall measures of these constructs. A year after the conclusion of the CELP programs, a closer look was taken by performing follow-up interviews with five participants using an additional interview protocol. Themes and patterns were analyzed borrowing from the tradition of within-case study analysis using a constant comparative method. The results and a discussion of the findings along with suggestions for future research will be outlined in the chapters to follow.

CHAPTER 4: FINDINGS

As stated in Chapter 1, the study reported here examined in detail the relationships between Environmental Identity (EI), Personal Environmental Education Teacher Efficacy (PEETE), and peak Stage of Concern (SOC) for implementing California's Environmental Principles and Concepts (CA EP&Cs) for teachers participating in California Environmental Literacy Project (CELP) programs. This chapter is organized in two parts. Part 1 – The Big Picture focuses on a set of research questions pertaining to overall results from the 72 educators who completed the Environmental Literacy Education Questionnaire (ELEQ). Part 2 – A Closer Look explores these relationships further using follow-up interviews conducted with 5 teacher participants - a subset of the 72 educators who completed the ELEQ, from the various CELP programs. An overview of the data analysis approach taken to address each research question is provided in Table 3.

Table 3

Overview of the Data Analysis by Research Question

Research Question	Type of Research Methodology	Method of Data Analysis
1. What is the level of Environmental Identity (EI) of teachers who participate in California Environmental Literacy Project (CELP) programs?	Quantitative	Descriptive statistics – Frequency distribution.
2. What is the level of Personal Environmental Education Teacher Efficacy (PEETE) of teachers who participate in CELP programs?	Quantitative	Descriptive statistics – Frequency distribution.

Table 3 (continued)

3. What is the peak Stage of Concern (SOC) of implementing CA EP&Cs for teachers who participate in CELP programs?	Quantitative	Descriptive statistics – Frequency distribution.
4. What potential barriers and/or concerns do teachers who participate in CELP programs report for the implementation of CA EP&Cs?	Quantitative and Qualitative	Frequency distribution and within-case study theme analysis using constant comparative method.
5. Is there an association between the levels of EI and levels of PEETE for teachers who participate in CELP programs?	Quantitative	Descriptive statistics – Scatterplot and Pearson correlation
6. Is the stage of concern for implementation of California's Environmental Principles & Concepts (EP&Cs) associated with the level of EI for teachers who participate in CELP programs?	Quantitative	Descriptive statistics – Scatterplot and Pearson correlation
7. Is the stage of concern for implementation of California's EP&Cs associated with the level of EETEB for teachers who participate in CELP programs?	Quantitative	Descriptive statistics – Scatterplot and Pearson correlation
8. Who are the teachers participating in follow-up interviews?	Qualitative	Within-case study theme analysis using constant comparative method.
9. How do these teachers describe themselves in the context of teaching environmental literacy?	Qualitative	Within-case study theme analysis using constant comparative method.
10. How do these teachers feel their participation in the CELP program affected their teaching of environmental literacy?	Qualitative	Within-case study theme analysis using constant comparative method.

Part 1 – The Big Picture

Research Question 1

The first research question asks: What is the level of Environmental Identity (EI) of teachers who participate in CELP programs? The Environmental Identity Scale (EID) response options span choices from “not at all true of me” (1) to “completely true of me” (7). Six (8.5%) teachers’ average response to the EID items fell in the mid-range of this scale (3.51-4.50) indicating neither a low nor high level of identity with the environment. Four of the teachers’ average responses indicated slightly lower levels of environmental identity (i.e., below the scale’s midpoint). As shown in Table 4, the remaining 61 participants (86% of the total sample) responded above the midpoint, with 55 of those participants expressing strong environmental identity (with average responses of 5.51 or higher out of a maximum of 7 possible).

Table 4

Level of Environmental Identity (EI) in CELP Participants

Average Response to EID Items	Frequency	Valid Percent
1.00 – 1.50	0	0.0
1.51 – 2.50	0	0.0
2.51 – 3.50	4	5.6
3.51 – 4.50	6	8.5
4.51 – 5.50	6	8.5
5.51 – 6.50	32	45.1
6.51 – 7.00	23	32.4
Total Valid Responses	71	100.0
Incomplete Data	1	
Total	72	

Note: Response options range from “not at all true of me” (1) to “completely true of me” (7) with higher scores indicating greater identification with the environment. Scores are averages across multiple EID items.

Research Question 2

The second research question asks: What is the level of Personal Environmental Education Teacher Efficacy (PEETE) of teachers who participate in CELP programs? The scale for PEETE begins at 1 corresponding to an answer of “strongly disagree” and ends at 6 corresponding to an answer of “strongly agree”. There is no neutral response option; respondents must at least either “slightly disagree” or “slightly agree.” Thus, after averaging across the items and regrouping scores based on means, those who tend to slightly disagree will be within the 2.51-3.50 range and those who tend to slightly agree will be within the 3.51-4.50 range. One participant tended to disagree; one participant tended to slightly disagree (see Table 5). Nearly all teachers (97.2%) tend to express at least slight agreement. Over half the respondents (n=38, 52.8%) tended to agree and nearly one-quarter (n=17, 23.6%) strongly agreed with the items regarding their personal environmental education teacher efficacy.

Table 5

Level of Personal Environmental Education Teacher Efficacy (PEETE) in CELP Participants

Average response to PEETE Items	Frequency	Valid Percent
1.00 – 1.50	0	0
1.51 – 2.50	1	1.4
2.51 – 3.50	1	1.4
3.51 – 4.50	15	20.8
4.51 – 5.50	38	52.8
5.51 – 6.00	17	23.6
Total	72	100

Note: Response options include “strongly disagree” (1); “disagree” (2); “slightly disagree” (3); “slightly agree” (4); “agree” (5); and “strongly agree” (6) with higher scores indicating greater teacher self-efficacy. Scores are averages across multiple PEETE items.

Research Question 3

The third research question asks: What is the peak Stage of Concern (SOC) for implementing CA EP&Cs for teachers who participate in CELP programs? The Peak SOC was determined for each participant by analyzing participant responses from the Stages of Concern Questionnaire (SOCQ). The scores from each question in the SOCQ associated for each SOC was tabulated and the highest SOC raw score for each respective participant was determined. Then the SOC raw score was translated to a percentage as methodologically prescribed in the *Measuring Implementation in Schools: The Stages of Concern Questionnaire*. The SOC with the highest percentage for each participant was determined as the peak SOC. The peak SOC regarding the implementation of CA EP&Cs that was most frequent for the participants in this study was stage 0, followed by stage 5 and stage 1 (see Table 6). In the Concerns-Based Adoption Model (CBAM) framework, stage 0 is defined as “unconcerned” and is associated with people who have “little concern about or involvement with the innovation” (Hall and Hord, 2015, p. 86). This is an indication that many teachers (41.7%) in the CELP program at this point have yet to begin implementing the CA EP&Cs in their teaching. The second highest frequency peak SOC was stage 5 – “collaboration.” For these participants this is an indication that the teachers (27.8%) are concerned about working with other educators in implementing the CA EP&Cs (Hall and Hord, 2015). The third highest frequency peak SOC was stage 1 – “Informational.” This is an indicator that for this subgroup of teachers (15.3%) their main concern with implementing the CA EP&Cs is learning more about what the CA EP&Cs are. These teachers are likely to be at a very early stage of implementation.

Table 6*Frequency of Peak Stage of Concern*

Stage of Concern	Label	Frequency	Percent
0	Unconcerned	30	41.7
1	Informational	11	15.3
2	Personal	5	6.9
3	Management	2	2.8
4	Consequence	1	1.4
5	Collaboration	20	27.8
6	Refocusing	3	4.2
Total		72	100

Research Question 4

The fourth research question asks: What potential barriers and/or concerns do teachers who participate in CELP programs report for the implementation of CA EP&Cs? Seventy-two ($n=72$) participants completed the Environmental Literacy Education Questionnaire. In the ELEQ there were two opportunities for participants to share concerns regarding the implementation of CA EP&Cs. Participants could select more than one barrier; therefore, the total number of barriers identified ($n=79$) exceeds the number of respondents ($n=72$). In fact, 23 participants (31.9%) chose the statement, “I have not experienced any barriers.” Therefore, the remaining 49 participants checked a total of 79 barriers. See Table 7 which provides the barriers listed on the survey along with the number of respondents who marked each barrier. Percentages are provided in terms of the total number of reported barriers ($n=79$); in terms of the number of participants who marked any of the listed barriers ($n=49$) (i.e., excluding the option, “I have not experienced any barriers.”); and in terms of the total number of survey respondents ($n=72$).

Table 7*Reported Potential Barriers preventing Teaching Aspects of Environmental Literacy*

Reported Potential Barriers Preventing Teaching Aspects of Environmental Literacy	Frequency	Percent of all Barriers (n=79)	Percent of All Participants Who Experienced Any Barriers (n=49)	Percent of All Survey Respondents (n=72)
Insufficient instructional minutes have been allocated by my administration to teach environmental literacy.	35	44.3%	71.4%	48.6%
There is no curriculum provided by my district that provides substantial elements of environmental literacy.	29	36.7%	59.2%	40.3%
My school site or district administrators do not allow me to take students outside to learn.	6	7.6%	12.2%	8.3%
It is difficult to secure busing to take students outside.	4	5.1%	8.2%	5.6%
I need more professional development to feel confident to teach environmental literacy	2	2.5%	4.1%	2.8%
My administrators insist I use adopted curriculum.	1	1.3%	2.0%	1.4%
I am concerned I will get pushback from families.	1	1.3%	2.0%	1.4%
Not all science topics lend themselves to connections to the environment.	1	1.3%	2.0%	1.4%
Total Reported Potential Barriers	79	100.0%	n/a	n/a
I have not experienced any barriers.	23	n/a	n/a	31.9%

Based on the 49 teachers who did identify one or more barrier from the list, the highest reported barrier is teachers reporting that there is insufficient instructional minutes allocated by

administrators to teach environmental literacy (71.4%). Another top barrier provided was lack of curriculum containing substantial elements of environmental literacy (59.2%). Again, 23 teachers (31.9%) reported that there is no barrier to implementing environmental literacy.

The second opportunity to share concerns came from the open-ended question “Please describe any concerns that you may have about teaching California’s EP&Cs with your students. Otherwise, if you have no concerns, please note that.” Of the 75 participants, 60 answered the open-ended question. The response that emerged most often was a response of no concern. This was provided by 28 participants.

The theme that emerged from participant responses second most often had to do with time. Participants shared that there is not enough time in the day to bring students outside into nature for rich environmental education learning. One participant shared, “Time is the biggest issue we have. We have just a small time for science, let alone the EP&Cs. Integrating them into ELA will be a helpful way to incorporate them and find the time” (Survey Respondent #30).

Another prevalent theme that emerged from the participants was challenges having to do with the COVID pandemic and distance learning. One participant shared this about her concern, “Right now, how to do these kinds of BIG projects with kids at home. (We have 100 trees coming and I still can't wrap my head around how I am going to get them to the families to get new understory trees planted to replace some of the trees burned in our CZU fire.) I know kids get excited when it is real world, it is tricky right now” (Survey Respondent #9). This teacher is trying hard to keep a focus on environmental literacy but the logistics around providing students with rich and relevant experiences in a distance learning environment are difficult.

A third theme that emerged from participant responses has to do with the environmental education teacher self-efficacy that teachers may be grappling with. Several teachers mentioned

that they simply need more training or professional learning to be able to bring CA EP&Cs to their students. One participant stated, “My largest concern is that I do not have the skills to impart an appreciation and understanding of the EP&Cs” (Survey Respondent #65).

Each of the concerns that emerged from the participants can be categorized by the Stage of Concern from the CBAM framework. Table 8 lists the concern, frequency of stated concern with respect to the 60 responses that were provided by participants, and the stage of concern that each concern stated is associated with.

Table 8

Themes of Concern for Teaching CA EP&Cs and Corresponding Stage of Concern

Concern	Frequency	Stage of Concern	Type of Concern
I have no Concern with teaching CA EP&Cs.	46%	Stage 0	Unconcerned
There is not enough time to teach CA EP&Cs.	18%	Stage 2	Personal
Distance learning (during COVID pandemic) makes teaching CA EP&Cs more difficult.	10%	Stage 2	Personal
I need more training to teach the CA EP&Cs to my students.	8%	Stage 2	Personal
There is not enough curriculum and resources available.	7%	Stage 1	Informational
It is difficult to bring students out into nature to learn.	7%	Stage 2, Stage 3	Personal, Management
I'm concerned that my colleagues are not more aware of the CA EP&Cs.	5%	Stage 5	Collaboration
I'm concerned with how to integrate the CA EP&Cs with other content areas.	5%	Stage 3	Management

Table 8 (continued)

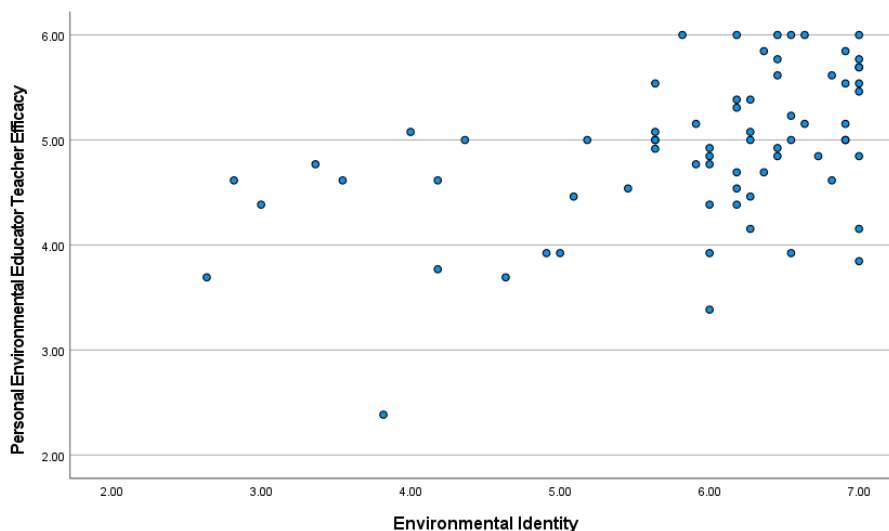
I'm not sure what the CA EP&Cs are.	2%	Stage 1	Informational
I'm concerned about my personal health when teaching the CA EP&Cs.	2%	Stage 2	Personal
I'm concerned about getting district support for teaching CA EP&Cs.	2%	Stage 3	Management
I'm concerned about parent push-back about teaching a politically charged topic.	2%	Stage 2	Personal

Research Question 5

The fifth research question asks: Is there an association between Environmental Identity (EI) and Personal Environmental Education Teaching Efficacy (PEETE)? A Pearson correlation test was conducted using the correlation ($r = .474$) found between the level of EI and level of PEETE using scores from 71 participants. The positive association was significant ($p < .001$) and indicates that 22.5% of the variance in either of the variables can be accounted for using the remaining variable. Thus, using Cohen's (1988) conventions, this is a moderately large association between environmental identity and teacher efficacy related to environmental education. A scatterplot of the relationship is shown in Figure 10 below.

Figure 10

Scatterplot of Relationship Between Personal Environmental Education Teacher Efficacy and Environmental Identity



Research Question 6 and 7

The sixth (and seventh) research questions, respectively, ask: Is the stage of concern for implementation of California's Environmental Principles & Concepts (EP&Cs) associated with the level of EI (PEETE) for teachers who participate in CELP programs? Table 9 shows the Pearson correlations between the Peak SOC and both the EI and PEETE scores.

As shown in Table 9, the two-tailed significance exceeds .05 (alpha, the Type One error rate, employed for this study) for the correlation between EI and peak SOC and for the correlation between PEETE and peak SOC. Therefore, neither are statistically significant Pearson correlations. There is insufficient evidence from this sample's data to suggest that peak stage of concern (SOC) for implementing CA EP&Cs depends on environmental identity (EI) or on teacher efficacy (PEETE).

Table 9

Pearson correlations between EI, PEETE, and Peak SOC with sample sizes and p-values from two-tailed tests of statistical significance

	Pearson Correlation with Peak Stage of Concern (SOC)	<i>N</i>	<i>p</i> -value (two- tailed)
Environmental Identity (EI)	.128	71	.288
Personal Environmental Education Teaching Efficacy (PEETE)	.050	72	.679

Part 2 – A Closer Look

Research Questions 8, 9, and 10

The results from interviews with five of the original survey respondents allow us to take a closer look as we address the last three research questions: Who are the teachers participating in follow-up interviews? How do these teachers describe themselves in the context of teaching environmental literacy? How did participation in the CELP program affect their teaching of environmental literacy?

Pseudonyms were given to the five participants who were interviewed as shown in Table 10. Native species of birds that I grew fond of observing in the San Joaquin County area were used to generate the pseudonyms. Goldfinch and Quail are teaching partners at the same school site and participated in the San Joaquin County CELP program together. Heron also participated in the San Joaquin County CELP program. Kingfisher and Magpie participated in the Santa Cruz County CELP and San Diego County CELP program, respectively. Generally borrowing from the tradition of case study, specifically using an embedded case study design, I will provide

analysis from each embedded case, and then provide a summary of common patterns in the case study related to each qualitative research question in Chapter 5.

Table 10

Interview Participants Demographics

Pseudonym	Grade/Course Taught	CELP Region	Environmental Identity (scale of 1-7)	Personal Environmental Education Teaching Efficacy (scale of 1-6)	Peak Stage of Concern
Goldfinch	6 th Grade	San Joaquin County	2.82	4.62	5
Quail	6 th Grade GATE	San Joaquin County	5.09	4.46	0
Heron	High School: Econ/American Government	San Joaquin County	*	5.08	4
Killdeer	High school: AP Environmental Systems, AP Chemistry, Chemistry	Santa Cruz County	6.18	5.38	0
Magpie	8 th Grade	San Diego County	3.36	4.77	1

* Participant partially completed this section of the questionnaire, so no Environmental Identity score could be determined.

Case Profiles and Discussion from Qualitative Interview Results

Participant #1: Goldfinch

Demographics. The first participant will use the pseudonym “Goldfinch,” an individual who currently teaches sixth graders in general education. She stated that aptitude tests she took in

high school indicated her preferences for working with the environment and her major in college was in environmental education. Prior to becoming a teacher, Goldfinch worked for a year at an outdoor education facility. She indicated an interest in becoming an administrator, specifically a vice principal.

Environmental Identity. Goldfinch described her environmental identity as an “environmental educator” and an “environmental learner,” as she is learning how the environment fits into her world. She helps her students understand their role with the environment and helps them see what their role will be as they get older and assume responsibilities in society.

Personal Environmental Education Teacher Efficacy. Goldfinch indicated she is able to access the California Environmental Principles and Concept (EP&Cs) but is not yet comfortable with the different levels of the standards and principles. Later in her interview, Goldfinch gave several examples of ways she views herself, not as strong as the high school teachers who use technical science terminology, but leading her students to ask good questions, such as why Great White Egrets “are there in the morning, but not in the afternoon. Why do they have the legs and neck they have? Why are they white? ... We harness nature for student inquiry. They all go together. If I’m open to the environment, then I’m looking and observing and acknowledging phenomena, I’m a scientist and advocating for nature and the environment.” She stated: “Teachers are actresses and actors that bring their passion into the classroom. It’s important that if I’m passionate, if I believe in it, the kids are going to see it. They will want to understand it the same way I do.”

Stage of Concern for the implementation of California’s Environmental Principles and Concepts. Goldfinch described herself as feeling uncomfortable with the EP&Cs. Since she

doesn't have enough time to implement them with the focus on English/Language Arts and mathematics, she incorporates environmental education into science and social science. "Then I'm using the EP&Cs to inform my students and getting them to see things and open their eyes to nature. They are bonded, you can't do one without the other. You need them all." She commented, "I wish our district was more open to it [environmental education]. I wish the EP&Cs were just as important as language arts and math. Society is heading down a really bad path and we need to instill in this generation how important it is to take care of the earth..." In Goldfinch's response to the question from the ELEQ regarding concern for teaching CA EP&Cs, she stated "I'm concerned about integrating the EP&Cs in my already full schedule." Goldfinch's peak stage of concern from her SOCQ is stage 5. Her overall concern for implementing CA EP&Cs is an "impact" concern.

Connection between a CELP Participants' Environmental Identity, Environmental Education Teacher Self Efficacy, and Implementation of CA EP&Cs. In her interview, Goldfinch shares that she thinks all three of these factors are related. "If I'm open to the environment, then I'm looking and observing and acknowledging phenomena. I'm a scientist and advocating for nature and the environment. Then I'm using the EP&Cs to inform my students and getting them to see things and open their eyes to nature."

Personal and Professional change as a result of participation in the California Environmental Literacy Project (CELP). Participating in the CELP program gave Goldfinch more confidence to bring her passion for environmental education directly into her teaching. One of the sessions that had a significant impact on her teaching was a workshop involving a prominent nature journalist. Goldfinch stated in her interview that this instructor "helped me see the connection and how to bring environmental education into my classroom." She now uses the

pedagogical approach that was introduced in the CELP program of *I notice, I wonder, it reminds me of* with her students throughout the school year. Goldfinches' awareness and understanding of CA EP&Cs was increased. Local natural phenomena like lizards, spiders, egrets, fungus, and other plants and animals became the focus of classroom nature journaling and inquiry as a result of her participation in CELP.

Participant #2: Quail

Demographics. The second participant will use the pseudonym “Quail,” an individual who currently teaches sixth grade students in Gifted and Talented Education (GATE) program. Quail identifies as a single person who doesn't like change and has been in the same classroom for 19 years.

Environmental Identity. Quail described her environmental identity as something that became more of a “thing” because of her teaching partner. Her teaching partner is the first participant in the follow-up interviews, Goldfinch. Quail states that “Earth is important. Her students are aware of the environment and have lots of questions about it.”

Personal Environmental Education Teacher Efficacy. Quail was quick to point out that if it wasn't for her teaching partner, Goldfinch, she would not be adding this environmental education focus into her classroom. With the support and collaboration on lesson plans with Goldfinch she began to develop the confidence to bring the environmental education to her teaching.

Stage of Concern for the implementation of California's Environmental Principles and Concepts. Based on Quail's discussion of concern for the implementation of EP&C's, her stage of concern seems to be at level one or two, self-concern. She states that “For someone who holds a multiple subject credential, this is not our area of expertise. I did not receive instruction

on this, maybe one day in one class. I'm a Jack of all trades and a master of none." In Quail's response to the question from the ELEQ regarding concern for teaching CA EP&Cs she stated "Time is the biggest issue we have. We have just a small time for science, let alone the EP&Cs. Integrating them into ELA will be a helpful way to incorporate them and find the time." Quail's peak stage of concern from her SOCQ is stage 0. Her overall concern for implementing CA EP&Cs is a "self" concern.

Connection between a CELP Participants' Environmental Identity, Environmental Education Teacher Self Efficacy, and Implementation of CA EP&Cs. Quail shared that if you don't have an environmental identity, it would be difficult to teach those standards. She then referenced a personal experience of being in Hawaii on vacation and remembering her connection to nature as she experienced the calm of the beach and thinking about how important it is to protect nature. She states "The next step is wanting to bring this into your lessons so that we can have a big influence. Gifted students run with this; their generation is so enthusiastic about the environment."

Personal and Professional change as a result of participation in the California Environmental Literacy Project (CELP). For Quail, the CELP program gave her what she needed to start the implementation of CA EP&Cs. Before participating in CELP she was unaware the CA EP&Cs existed. She states, "It gave you the lessons and confidence that you could do this right. You can teach nature journaling and the things you can do incorporate [environmental literacy] into your lessons." When it comes to environmental education teacher self-efficacy, the CELP program helped Quail realize that she doesn't have to be an expert to bring environmental education to her students, that she could learn together through inquiry with her students.

Participant #3: Heron

Demographics. The third participant will use the pseudonym “Heron,” an individual who currently teaches seniors in the content areas of government and economics. Heron identifies as American with an ethnicity of Indian. She stated that she is a hiking and trekking enthusiast that loves the outdoors.

Environmental Identity. Heron shared that she likes to take long walks in nature to explore and identify plants. She wants to do more of this when she has more free time in the summer after school gets out. Recently, she attended a program at a nearby university and was fascinated by the identification of the plants from the university campus. She would like to draw and catalog plants to learn more about the various species.

Personal Environmental Education Teacher Efficacy. When teaching freshmen in a course on global studies there was a unit on global environment that increased her interest in learning more about teaching environmental education. Heron was unaware of the CA EP&Cs before attending the CELP program. She stated that after seeing the EP&Cs “I was able to see what standards I was already using in the classroom.” Heron mentioned that when she went to school in India class was often held outside, but in the United States that is not done very often.

Stage of Concern for the implementation of California’s Environmental Principles and Concepts. Heron stated that one of her biggest concerns was “getting admin. on board. It was difficult.” She mentioned that getting permission to take students outdoors was a challenge that would often be delayed as her administration looked into the legalities of this. She mentioned that the students were all for it, but the school district’s lawyers would have to analyze her request. In Heron’s response to the question from the ELEQ regarding concern for teaching CA EP&Cs she stated, “I am unable to carry out the hands-on activities during

COVID.” Quail’s peak stage of concern from her SOCQ is stage 4. Her overall concern for implementing CA EP&Cs is an “impact” concern.

Connection between a CELP Participants’ Environmental Identity, Environmental Education Teacher Self Efficacy, and Implementation of CA EP&Cs. Heron shared that there is a “big connection between environmental identity and environmental education teacher self-efficacy and implementation of CA EP&Cs. Without identity, I may not be interested in teaching this.” Heron shared that in order to implement the CA EP&Cs that confidence in teaching about the environment is important.

Personal and Professional change as a result of participation in the California Environmental Literacy Project (CELP). Heron shared “I learned so much in the 2 years at CELP and I could bring that into my classroom very easily. Connecting to the standards was one of the outcomes.” In terms of her environmental identity, “I identify myself more with nature. I always had the identity, but my participation strengthened it.” She shared that she is intrinsically motivated to learn about the environment and that she was able to learn for other colleagues that were participating in CELP in terms of how they were incorporating environmental education into their teaching.

Participant #4: Killdeer

Demographics. The fourth participant will use the pseudonym “Killdeer,” an individual who identifies herself as a middle class, middle aged White woman. Killdeer teaches AP Environmental Systems, AP Chemistry, and Chemistry at the high school level.

Environmental Identity. Killdeer shared that “she always thought of myself as an environmentalist. I had big dreams of becoming an environmental activist. I did a college internship working for an environmental group and did water quality testing with a satellite lab.”

After getting burned out with very little pay as an environmental activist she pursued teaching and brought her passion for environmental education to the classroom.

Personal Environmental Education Teacher Efficacy. When Killdeer arrived at her high school the course AP Environmental Systems was not being taught throughout the school district. She proposed the course to her school board and led the effort for the class to be taught in each high school within her school district. Killdeer shared, “I think I’m effective at teaching environmental issues because I think of myself as an environmentalist. I can bring first-hand knowledge. I worked on a campaign that banned chemical pesticides. I have a lot of experience outside of my teaching life because I am an environmentalist. I convey a passion for it, and I have first-hand experience. I’m aware of movements for environmental issues.”

Stage of Concern for the implementation of California’s Environmental Principles and Concepts. When interviewed, Killdeer was unaware of the CA EP&Cs. Her stage of concern is stage 0. When asked about the CA EP&Cs, she states “Honestly, I have no idea what that is. I’m assuming they are some kind of environmental standards. My colleagues and I are focused on teaching the Next Generation Science Standards and that there are some pretty good environmental standards in there.” In Killdeer’s response to the question from the ELEQ regarding concern for teaching CA EP&Cs she stated, “I feel like I am not the best person to answer this question. My teaching assignment is mostly chemistry. Every year 5/6 of my classes are either chemistry or AP Chemistry, but the other class I teach is AP Environmental Science. Even in chemistry class, I bring in environmental topics, but I am not sure they are the EP&C’s since I am not sure what those are. I attended one training through the county office of education, but I don’t feel like I am part of a big environmental literacy team...But if the question is just about teaching environmental topics in my class, the answer is I don’t really have any concerns

except the fact that sometimes it is hard to make the connection with certain chemistry topics.”

Killdeer’s peak stage of concern determined from analyzing her Stage of Concern Questionnaire (SOCQ) from her Environmental Literacy Education Questionnaire (ELEQ) entry is stage 0.

However, her overall concern for implementing the CA EP&Cs based on her response to the ELEQ is an “impact” concern.

Connection between a CELP Participants’ Environmental Identity, Environmental Education Teacher Self Efficacy, and Implementation of CA EP&Cs. Killdeer attributes her environmental education teacher self-efficacy to her identifying as an environmentalist and her first-hand experience in this arena. Having worked on environmental issues for organizations she is able to bring authentic personal context to her lessons and she is confident in her ability to do so. Killdeer’s lack of awareness regarding the CA EP&Cs prevents her from being able to make connections between the implementation of these standards and the factors of environmental identity and environmental education teacher self-efficacy.

Personal and Professional change as a result of participation in the California Environmental Literacy Project (CELP). Killdeer shared that her participation in CELP did not affect her environmental identity. She did share that her participation in CELP and another program focused on teaching chemistry through social justice “gave us ways to incorporate environmental topics into Chemistry. It gave me ways to anchor NGSS work in environmental phenomenon. I now incorporate ocean acidification, climate change, and air pollution into my [chemistry] units.”

Participant #5: Magpie

Demographics. The fifth participant will use the pseudonym “Magpie,” an individual who currently teaches eight grade science for a middle school. Magpie identifies as a White

cisgender Jewish man originally from Upstate New York. He shared that he feels like a “non sequitur” because being a transplant to California from New York he is often different than what people expect him to be when they first meet him.

Environmental Identity. Magpie described his environmental identity as something that has undergone extensive transformation from when he was an adolescent. “I never went camping as a kid. I was a city kid. My wife and I went camping at seven National Parks. It changed my perspective with connecting with nature physically, emotionally, and spiritually. After moving to California, he was able to work for his mother-in-law’s organic gardening business and then later with a master gardening program. Magpie went onto to say, “I now have a perspective that science is what humans can learn from the universe. Environmental literacy and the idea of engaging in outdoor education was part of that transformation for me. One of the most important things a science educator can do is get kids out of the classroom into nature.”

Personal Environmental Education Teacher Efficacy. Magpie shared that he became more confident in teaching about the environment after participating in CELP. He now had a framework to lean on when implementing environmental literacy in his science classroom. He is able to reference the environmental literacy standards directly and can confidently share them with his colleagues. His experience in a master gardening program provided him with time and place to expand his understanding of the natural world and to enhance his ability to bring that environmental literacy to his students.

Stage of Concern for the implementation of California’s Environmental Principles and Concepts. Magpie was able to speak to the CA EP&Cs in detail. He is currently working to encourage his colleagues who teach math and history to use the EP&Cs for prompts for context and writing. The stage of concern that Magpie expresses is stage 4 or 5. He is both concerned

with the impact of his use of these standards as well as how to provide greater access for his colleagues to use these standards in their teaching. He shared, “I wish the EP&Cs were embedded in NGSS because I have a hard enough time convincing colleagues that SEPs and CCCs [dimensions within NGSS] are important.” Here he is alluding to the fact that very few teachers are aware of the CA EP&Cs due to the fact they are included in some of California’s frameworks as appendix items but are not directly listed in California’s teaching standards. In Magpie’s response to the question from the ELEQ regarding concern for teaching CA EP&Cs he stated “I am concerned that science is the ONLY class that ‘knows’ about these standards. It would be NICE to discuss and collaborate with history or English teachers to facilitate learning across disciplines.” Magpie’s peak stage of concern from his SOCQ is stage 1, but he also had a high score of stage 5. His overall concern for implementing CA EP&Cs is an “impact” concern.

Connection between a CELP Participants’ Environmental Identity, Environmental Education Teacher Self Efficacy, and Implementation of CA EP&Cs. Magpie shared that environmental identity and environmental education teacher self-efficacy have a connection, but the implementation of CA EP&Cs has more to do with overcoming the logistics of providing students access to outdoor education. He states, “Location and resources of the school can really help promote the teaching of CA EP&Cs if it is easier for students to get outside.” Magpie believes that environmental identity will help determine if a teacher incorporates environmental education in their teaching, but their pedagogical approach requires training.

Personal and Professional change as a result of participation in the California Environmental Literacy Project (CELP). Magpie shared that his participation in CELP, “confirmed things I already felt strong about. It made me realize that I was doing things previously when I wasn’t calling them out. Now when I teach the climate change unit, I use the

EP&Cs as a framework for my students.” His participation in CELP helped provide an explicit framework for him to lesson plan with.

Chapter Summary

This chapter presented the findings from this two-part mixed methods study. Part one of the analysis presented pertains directly to research questions one through seven and revealed key findings pertaining to the 72 teachers participating in CELP programs who also participated in this research study. Part two of the analysis focused in on the five CELP teachers who participated in follow-up interviews and pertains directly to research questions eight through 10.

CHAPTER 5: DISCUSSION

Review of Dissertation

The purpose of this mixed methods research study was to determine the relationships between Environmental Identity (EI), Personal Environmental Education Teacher Efficacy (PEETE), and peak Stage of Concern (SOC) for implementing California's Environmental Principles and Concepts (CA EP&Cs). In addition, the study aimed to understand teacher perceptions of how their participation in the CELP program affected their teaching of environmental literacy. Survey respondents included 72 in-service teachers from five regions in California who were participating in the California Department of Education's California Environmental Literacy Project (CELP) programs at the time they completed the survey and five of them who served were individually interviewed after the CELPs had ended

Research Questions

The first seven research questions were informed by 72 teachers who participated in a regional CELP program and agreed to complete the Environmental Literacy Education Questionnaire (ELEQ). The remaining three questions take a closer look at a subset of five teachers who agreed to follow-up interviews.

Part 1 – The Big Picture

1. What is the level of Environmental Identity (EI) of teachers who participate in California Environmental Literacy Project (CELP) programs?
2. What is the level of Personal Environmental Education Teacher Efficacy (PEETE) of teachers who participate in CELP programs?

3. What is the peak Stage of Concern (SOC) of implementing CA EP&Cs for teachers who participate in CELP programs?
4. What potential barriers and/or concerns do teachers who participate in CELP programs report for the implementation of CA EP&Cs?
5. Is there an association between the levels of EI and PEETE for teachers who participate in CELP programs?
6. Is the peak stage of concern for implementation of California's Environmental Principles & Concepts (EP&Cs) associated with the level of EI for teachers who participate in CELP programs?
7. Is the peak SOC for implementation of California's EP&Cs associated with the level of PEETE for teachers who participate in CELP programs?

Part 2 - A Closer Look

8. Who are the teachers participating in follow-up interviews?
9. How do these teachers describe themselves in the context of teaching environmental literacy?
10. How do these teachers feel their participation in the CELP program affected their teaching of environmental literacy?

Summary of Findings

Key findings based on the survey responses (Part 1) and the interviews (Part 2) are highlighted below.

Part 1 – The Big Picture

The level of EI and the level of PEETE for teachers who participated in this study was high. Eighty-six percent of teachers surveyed had an EI above the midway point on the EID scale

and 97% of teachers surveyed had a PEETE above the midway point of the PEETE scale. This may, in part, be due to the fact that teachers self-select to participate in CELP programs across the state of California and the topic of environmental literacy professional learning may have attracted teachers who are connected to nature and have some level of confidence in teaching about environmental education previous to their participation.

The most frequent peak SOC for implementation of CA EP&Cs (accounting for 41.7% of the respondents) based on analysis of the Stages of Concern Questionnaire data was Stage 0 – “Unconcerned”. This corresponds to participants with “little concern about or involvement with the innovation” (Hall and Hord, 2015, p. 84). The second highest frequency peak SOC was Stage 5 – “Collaboration”, with 27.8% of participants. This stage corresponds to an impact concern where “the focus is on coordination and cooperation with others regarding use of the innovation” (Hall and Hord, 2015, p. 86). The third highest frequency peak SOC was Stage 1 – “Informational”, with 15.3% of participants. This stage corresponds to a self-concern where “a general awareness of the innovation and interest in learning more detail about it is indicated” (Hall and Hord, 2015, p. 86).

The top barriers and concerns for teachers to implement CA EP&Cs are insufficient instructional minutes dedicated to implementation of environmental literacy and lack of curriculum to support the implementation. Teachers also reported that distance learning during the COVID pandemic made implementation of the CA EP&Cs even more difficult than when teaching is in-person. Additionally, a significant number of participants reported that there is a lack of support from their site administrators for taking students outside to learn about the environment and that there are financial and logistical challenges with securing busing for outdoor field trips.

When analyzing the relationship between EI, PEETE, and Peak Stage of Concern there was a statistically significant moderately large correlation of .474 between level of EI and level of PEETE. Therefore, approximately 22% of the variance in a teacher's PEETE can be attributed to their level of EI and vice versa. Additionally, there was insufficient evidence from this sample's data to suggest that peak SOC for implementing CA EP&Cs depends on environmental identity (EI) or on teacher efficacy (PEETE).

Part 2 – A Closer Look

The follow-up interviews revealed significant findings for each of the five participants. This section will focus on both the common themes and contrasting themes that have emerged from their follow-up interviews. The participants in this part of the study included two 6th grade teachers from an elementary school - Goldfinch and Quail; one 8th grade science teacher from a middle school - Magpie; a high school science teacher - Killdeer; and a high school history/social science teacher - Heron.

In terms of the Environmental Identity within the participating follow-up interviewees, there was a range of EI levels with Goldfinch and Magpie having the lowest EI with 2.82 and 3.36 respectively. Killdeer and Quail had the highest EI at 6.18 and 5.09 respectively. Magpie spoke about how his connection to nature was not very strong as a child growing up in New York but had developed recently as he has had more opportunities to connect with nature in his adult life. Similarly, Quail spoke about how her colleague, Goldfinch, helped her to develop her Environmental Identity, in recent years while participating in the CELP program. An emerging theme is that EI is not static and can develop in an individual's adult life even if it was not fostered as a child or young adult.

The levels of PEETE for the 5 participants involved in follow-up interviews ranged from least to greatest with Quail at 4.46 to Killdeer with a PEETE level of 5.38. This was a much smaller range than was seen in the range for EI for the same 5 participants. A theme that emerged for elementary teachers came from Goldfinch and Quail's interviews. They spoke of how, as elementary teachers, they do not feel as confident about teaching environmental literacy due to a lack of content knowledge as compared to CELP participants who teach high school. Despite having what Goldfinch and Quail spoke of as the insufficient requisite knowledge to teach about the environment, they both shared how they were able to learn with their students by using nature journaling as a platform for student-centered inquiry-based learning. Their pedagogical expertise was very evident in their interview. Another theme that emerged regarding PEETE was for the two self-contained secondary science teachers, Magpie and Killdeer. Both shared that they were focused on the integration of environmental literacy with the teaching on the Next Generation Science Standards (NGSS). They shared that they were putting time into identifying environmental phenomena to use as a context to teach the NGSS through in their courses.

The concern for implementing the CA EP&Cs also varied widely from the 5 participants in the follow-up interviews. At the time of the study, Quail and Killdeer had a peak SOC of 0 – “Unconcerned”; Magpie had a peak SOC of 1 – “Informational”; and Heron had a peak SOC of 4 – “Consequence”. Despite teaching about the environment in her Chemistry class and Advanced Placement Environmental Systems class, Killdeer was largely unaware of California's formal environmental literacy standards (CA EP&Cs). Magpie, another very knowledgeable science educator, also had a peak SOC more related to being concerned about what the CA EP&Cs are as opposed to the management or impact of teaching them. An emerging theme is

that science teachers may be more concerned about teaching the NGSS and less aware of the CA EP&Cs and their direct connection to the teaching of NGSS. Another theme that emerges is that elementary teachers, like Quail and Goldfinch, may need more support and professional development to sustain the teaching of environmental literacy.

Participation in CELP provided various personal and professional benefits to the five participants involved in follow-up interviews. Magpie, Killdeer, and Heron each spoke about how the collaboration time allowed for the integration of environmental topics and time for lesson planning focused on emphasizing environmental literacy in their discipline-specific teaching. Goldfinch, Quail, and Heron each spoke about how the outdoor experiences involving nature journaling were both personally enjoyable and professionally illuminating to learn about new ways to bring outdoor learning into their classrooms. Each of the participants, except for Killdeer, increased their awareness of CA EP&Cs from their participation in CELP as reported in the follow-up interviews.

Implications for Practice

The implications as related to the findings are categorized into three categories based on the audience that they most pertain to: environmental literacy professional development providers, school site and district administrators, and teachers.

Environmental Literacy Professional Development Providers

For environmental literacy professional development providers, it is significant that there is a moderately large Pearson correlation between EI and PEETE. Prior to this study, this correlation had not been researched and therefore a new finding has been added to the body of research surrounding EI and PEETE. As stated in the findings, EI can account for approximately 22% of the PEETE that a teacher may have. Since correlational findings do not directly indicate

causation, care must be taken in drawing implications from this result. However, a tempered interpretation of possible causal mechanisms can be imagined. Therefore, a professional development provider could provide their workshop participants with an EID survey prior to their workshop to gauge the EI of their participants and garner insight into the PEETE of their participants (as a whole group) to better inform how they would conduct professional development. If EI is low for incoming participants, it may be advisable to build in experiences rich in outdoor experiences that could build EI for the participants (e.g., nature hikes, observation of plants and animals, ecological studies, etc.). If EI is high, it is advisable to plan some of the workshop time to address common challenges to implementing CA EP&Cs directly in the workshop. Otherwise, content from the workshop may not translate back to the classroom to have an impact on student learning.

Another significant finding is that the peak SOC for implementing CA EP&Cs does not correlate with an individual's EI or PEETE. These results were unexpected, but very interesting. When designing this study, I fully expected teachers with high EI and PEETE to have higher peak SOC levels than what was determined. This is significant because it means that if these results can be generalized to CA teachers outside of the CELP programs, even our teachers who are connected with nature and have efficacy to teach environmental literacy to their students, may not teach CA EP&Cs due to additional barriers and challenges that are preventing this from occurring.

This is important for a professional development provider because this finding means that workshop participants may be entering into the professional learning workshop with high EI and high PEETE and still have low concern about implementing CA EP&Cs in their classroom. If the goal of the professional learning provider is to increase students' exposure to California's

environmental literacy standards, then it will take more than developing participants EI or PEETE. Even a three-year professional learning program such as CELP found a significant number of participants with peak stage of concern for implementing CA EP&Cs in stages zero and one. The systemic challenges to providing students access to environmental literacy standards are substantial and likely require sustained commitments to environmental literacy professional development from school or district leaders, in addition to programs like CELP.

Professional development providers may want to address barriers and challenges to environmental literacy implementation directly in order to increase the frequency of CA teachers implementing the CA EP&Cs. The top challenge or barrier to implementation as stated both in response to the ELEQ and follow-up interviews was lack of instructional time dedicated to environmental literacy in a teacher's schedule. A common way to include standards that are part of content areas outside of ELA and Math in the elementary setting is through integration of content standards. Environmental literacy professional development providers may want to bring curriculum into their workshops that integrate environmental literacy with ELA, Science, Math and History/Social Science to directly address the challenge of lack of dedicated instructional time.

A recommendation for how teachers may include environmental literacy standards within their daily teaching is by incorporating nature journaling into their classroom practice. In follow-up interviews, it was very apparent that teachers were able to use this method of teaching with high engagement and rigor with their students. When nature journaling students wonder about the natural phenomena they are observing, and this provides a rich place for student inquiry to drive student-centered instruction. Student-centered inquiry-based instruction is central to CA Common Core State Standards (CA CCSS) and CA Next Generation Science

Standards (CA NGSS). Therefore, nature journaling provides a natural integration point for environmental literacy.

A finding that environmental literacy professional development providers should be aware of is that a significant number of teachers, despite possibly having high EI and PEETE, are unaware of the CA EP&Cs and will need workshop time to directly learn about them. This finding was seen in both the ELEQ survey results and it surfaced in follow-up interviews. In addition to learning about the CA EP&Cs explicitly, it is also recommended that professional development providers facilitate making connections with teachers to California's History/Social Science standards and the CA NGSS. Resources such as *Appendix 2: Connections to the Environmental Principles and Concepts* of the CA Science Framework and *Sample Scope and Sequence for CA EP&Cs* are foundational documents that professional development providers may want to incorporate in their workshops to address the barrier of lack of curriculum and to provide teachers with a sense of possible scopes and sequences that could effectively incorporate CA EP&Cs.

Another significant finding for environmental literacy professional development providers to consider is that CELP programs have positive personal and professional impact on participating teachers. This finding came from the follow-up interviews, and it was clear that providing teachers with the space to collaborate, the topical focus of incorporating CA EP&Cs explicitly into their lesson planning and working in a rich natural context provided them with a variety of benefits. Nature journaling emerged as an activity that invigorated the connection to nature for participants and some, like Heron, carried this practice into their personal life after the CELP program. When asked in interviews, teachers can see connections between their EI and PEETE. Since teacher efficacy is a proxy for student outcomes (Bandura, 2004) and EI and

PEETE have a significant and moderately large correlation, it is worth noting that time spent connecting teachers to nature during environmental literacy professional learning may have larger benefits to student outcomes. Although this study did not longitudinally look at how EI, PEETE, or peak SOC for implementing CA EP&Cs changed over time, that would be an interesting follow-up study.

School and District Administrators

Effective district and school site administrators can have a direct impact on the priorities and the culture of a school. Their leadership can provide expectations for teachers to focus on school-wide and district-wide priorities. They are situated in a position to address some of the challenges and barriers that may be preventing greater implementation of CA EP&Cs.

The most significant barrier to the implementation of CA EP&Cs as stated by teachers in the ELEQ survey was not enough time for implementation. Out of the 34 elementary school teachers surveyed, 16 reported this barrier to implementation. To address this barrier, site administrators can work collaboratively with their staff to increase the implementation of CA EP&Cs. This may involve taking a closer look at the teaching schedule at the school site. Administrators can work with their teaching staff to help think through the challenge of balancing the schedule of when content from the various California state standards are to be taught throughout the day. Another strategy to find additional time for implementation could be utilizing integration to weave environmental literacy topics and standards into other content areas. District and site administrators can help encourage the allocation of their school site and district funds to provide technical support from County Offices of Education, or contact with other environmental literacy experts, to work with their staff to overcome the obstacle of lack of instructional time.

Another obstacle that site and district administrators are in a position to help teachers overcome is the reported lack of access to field experiences for students. In follow-up interviews, Heron shared that for legal reasons her school district declined her request to take students outside. Student safety is the number one priority for our site administrators. However, overly cautious policy and school culture can stifle the authentic experiences that our students require to understand the complex connections between human systems and natural systems. This was echoed by Magpie when he stated that the, “location and resources of the school can really help promote the teaching of CA EP&Cs if it is easier for students to get outside.” Here he is addressing the fact that school site budgets and district budgets often do not allocate funding for field experiences beyond the school yard. Many of our schools are located away from natural settings and too often students have not had the experience of accessing naturally preserved areas, such as state and national parks. Site administrators could allocate funds and approve field trip requests to allow more access to experiences that help shape the environmental identity of our students and provide the context necessary to increase their environmental literacy.

It is worth noting that the COVID-19 pandemic exacerbated the decline in student access to outdoor education programs. A national survey of environmental and outdoor science education organizations was conducted in 2021 and the results of this survey projected “some 11 million kids who would have been served by 1,000 organizations will have missed environmental and outdoor science learning opportunities. About 60% of them are from communities of color or low-income communities” (Collins et al., 2020). Administrators should be aware that many students, especially students of color, during the COVID-19 pandemic missed vital outdoor learning experiences and district administrators throughout the state of California and across the nation should consider it a priority to make up for these losses.

Overall, I would recommend that a school district or school site that would like to elevate environmental literacy take a systemic approach to this goal. Frequent and sustained professional development and teacher collaboration time are needed to provide teachers with the learning and planning time to teach CA EP&Cs. A schedule that prioritizes the teaching of these standards either in a discipline-specific or integrated approach is needed. Funding and authorization from administrators for teachers to access environmental and outdoor science education programs will further provide students with opportunities to expand their environmental literacy.

Teachers

The CA EP&Cs are a set of multi-disciplinary environmental literacy standards referenced in many of California's subject matter frameworks. These are California's environmental literacy standards and they do have a place in our classrooms. We must advocate for their inclusion in our teaching so that our students can be aware of the environmental challenges that face our society. Concerns have emerged among the ELEQ survey responses as well as within follow-up interviews regarding lack of time for implementation and lack of curriculum to teach the CA EP&Cs. The California science instructional materials adoptions that took place in 2016 required the inclusion of CA EP&Cs in each publisher's set of instructional materials as one of the requirements for the instructional materials to be state adopted. It is recommended that teachers identify where the CA EP&Cs are being emphasized in their state-adopted science instructional materials and incorporate those lessons into their classroom practice. Doing so may help to address the concern for lack of environmental literacy curriculum.

As for the lack of instructional time, I would advocate that teachers incorporate the CA EP&CS into subjects like ELA, Science, and History/Social Science. California's subject matter

frameworks provide guidance for the inclusion of the CA EP&Cs, and these frameworks should be referenced by teachers when lesson planning for the purposeful inclusion of these essential environmental literacy standards. Teachers may want to seek out professional learning opportunities, such as workshops provided by county offices of education, environmental literacy education non-profit organizations, and private and public universities. These opportunities allow teachers to work with colleagues and environmental literacy professional development providers to receive support in the inclusion of these standards in their teaching.

In terms of bringing students outside to learn, studies show the myriad of benefits to this practice. If your schoolyard is safe, there may be opportunities to bring students into this space for further inquiry-based learning. Once students are outside, nature journaling can be used to engage students in the natural world around them and connect them to the human and natural systems that are central to the CA EP&Cs. CA frameworks speak to the importance of wanting science to be relevant to students' lives and communities. The use of the schoolyard can serve this purpose.

Limitations of the Study

This study was conducted with a subset of 72 K-12 in-service teachers that have self-selected to be part of a 3-year grant project focused on environmental literacy in California. This proclivity to be involved in this very specific professional development opportunity focused on increasing the environmental literacy of students may have affected the average EI and/or PEETE of the teachers involved and therefore limit generalizability of the study. Additionally, the teachers involved in this study are from various regions within California and only represent less than 33% of the counties in the state. For this reason, results from this study may not be generalizable to other regions of CA or in the national context.

It should be noted that survey data was collected during the last few months of the 3-year implementation of the California Environmental Literacy Project (CELP) program and so the associations and correlations that were determined are for that specific snapshot in time and come towards the end of several years of professional development with teachers. Additionally, follow-up interviews occurred approximately 18 months after the conclusion of the CELP program. This extensive gap between the professional development program and when follow-up interviews occurred may have affected what participating teachers recall when asked about their experience.

It is also important to note that the concern for implementation of California's EP&Cs, as measured by the Stages of Concern Questionnaire (SOCQ), is just one of three diagnostic tools used in the Concerns Based Adoption Model (CBAM) to better understand implementation of an innovation. Specifically, the SOCQ measures emotions or feelings of the user regarding implementation. The other two diagnostic tools in the CBAM framework (that are not being used in this particular study), Level of Use (LOU) and Innovation Configuration (IC), provide information about the implementation of an innovation in terms of the behaviors of the user and the mechanics of the user's implementation, respectively. The choice to focus on Stage of Concern for implementation of the CA EP&Cs instead of LOU and IC was influenced primarily by my reservation that including all aspects of the CBAM framework in the study would be unfeasible to conduct research. It would introduce too many variables to relate back to EI and PEETE and would possibly involve unreasonable asks on the participants involved in the study in terms of additional instrumentation to collect data from, as LOU and IC have their own respective instruments to gather data with. I decided to narrow the study to focus on Stage of

Concern because I assumed that if implementation concerns can be shaped during professional development, then environmental literacy implementation may possibly increase.

Suggestions for Further Research

This study focused on the relationships between EI, PEETE, and peak SOC as seen at the end of California teacher's participation in CELP. This snapshot provided insight into teachers who have self-selected to participate in regional environmental literacy programs. However, the research design of this study did not allow for understanding how a teacher's involvement in a program such as CELP could change a teachers EI, PEETE, or peak SOC over time. After finding that there was no correlation between the peak SOC and EI or PEETE, I became curious whether these factors change at varying rates (which may attenuate correlations). For instance, maybe the average peak SOC for participating teachers changes at higher rates than the rate that EI and PEETE change. This is a question that this study does not answer and leaves room for a longitudinal study to be conducted over time from the initial participation in a regional environmental literacy program to the end of the participation.

Another question that I had during the execution of my research that my design is unable to answer is how the full CBAM framework could be incorporated to guide the implementation of CA EP&Cs. If a school district or a school site were to take my previous recommendation for a frequent and sustained focus on environmental literacy and was working with a professional development provider, such as a county office of education, to provide the technical assistance and professional development for the focus, it would be interesting to consider the stages of concern, levels of use, and innovation configurations for the teachers involved. A researcher may be able to better understand how these aspects of the Concerns-Based Adoption Model change

over time and provide insight to a professional development provider during the implementation of their environmental literacy program.

Conclusion

With such unprecedented risk to our environment from human impacts (IPCC, 2014) there is a clear need to ensure that people are equipped with the environmental literacy to recognize these issues and begin to solve them at scale. It is imperative that students throughout the K-12 grade span learn about these environmental issues and learn how we can begin to address them to curb environmental impacts and move toward a more sustainable future. In order to educate our students, we will need to prioritize the teaching of environmental literacy standards in K-12 instruction throughout the nation. In California, this means that our teachers will need to better understand the California Environmental Principles and Concepts (CA EP&Cs) and prepare for their inclusion in K-12 instruction.

In order to accomplish the challenge of preparing teachers to provide students with the environmental literacy necessary to understand the complexity of the interaction between human systems and natural systems, a variety of factors must be understood. The focus of this research is at the intersection between Personal Environmental Education Teacher Efficacy, Environmental Identity, and the concern for implementation of California's Environmental Principles and Concepts (CA EP&Cs). This study used a mixed methods approach to determine the relationships between environmental identity and personal environmental education teacher efficacy on their concern for implementing California's Environmental Principles and Concepts with their students.

The findings revealed that the overall Environmental Identity (EI) and Personal Environmental Education Teacher Efficacy (PEETE) of the participating teachers in the study

was high. There was a statistically significant moderately large correlation between the EI and PEETE of the teachers participating in the study, but their peak Stage of Concern for implementing CA EP&Cs did not correlate to EI or PEETE. The conclusion that I draw from these findings is that, even for teachers with high EI and high PEETE, the concern for implementing CA EP&Cs can be in the “unconcerned” or “self-concerned” categories for the majority of these teachers. This suggests that a program like the California Environmental Literacy Program (CELP) where teachers received environmental literacy professional learning in a summer workshop or over quarterly meetings throughout the year may not alone sufficiently address the prevalent barriers and challenges to the teaching of CA EP&Cs. The local priorities of a school or district may be overshadowing these professional learning efforts. It may be that a more sustained and frequent program for professional learning is needed to see the increased focus and implementation on teaching CA EP&Cs.

However, the CELP program did have significant personal and professional impacts on the teachers who participated as seen by the follow-up interviews where teachers provided more information into these impacts. Teachers were provided opportunities to increase their awareness to the CA EP&Cs and to collaborate on lesson planning to emphasize the inclusion of environmental phenomena and the environment as a context in their teaching. New instructional methods, such as using nature journaling, to provide an equitable student-centered inquiry-based approach to connecting students with their local environment were introduced to teachers. Some teachers chose to incorporate this approach into their practice back at their school site. The CELP program represented incremental progress toward increasing the environmental literacy of teachers and increasing the inclusion of CA EP&Cs in classroom instruction.

Environmental literacy professional development providers and school administrators from the site and district level may draw insights from this study. Increasing EI and PEETE for teachers participating in environmental literacy workshops will not necessarily translate into increased implementation of environmental literacy standards in the classroom. Challenges such as the perception that there is not enough time for instruction of environmental literacy in the classroom, there is not enough curriculum with this focus, and teachers don't feel prepared to teach environmental literacy need to be addressed at the site and district level. Including site and district administrators in the professional learning to elevate and address these teacher concerns may be a viable next step to improve implementation.

My hope is that this research provides additional insight into the problem of preparing K-12 in-service teachers in California for the implementation of CA EP&Cs. With the unprecedented environmental challenges that we currently face, it is imperative that we educate our K-12 students to be able to understand local and global issues and consider ways to address them for a more sustainable future.

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APPENDIX A: Science Teacher Efficacy Belief Instrument

Science Teaching Efficacy Belief Instrument*

Please indicate the degree to which you agree or disagree with each statement below by circling the appropriate letters to the right of each statement.

SA = Strongly Agree
A = Agree
UN = Uncertain
D = Disagree
SD = Strongly Disagree

1. When a student does better than usual in science, it is often because the teacher exerted a little extra effort.	SA	A	UN	D	SD
2. I am continually finding better ways to teach science.	SA	A	UN	D	SD
3. Even when I try very hard, I don't teach science as well as I do most subjects.	SA	A	UN	D	SD
4. When the science grades of students improve, it is most often due to their teacher having found a more effective teaching approach.	SA	A	UN	D	SD
5. I know the steps necessary to teach science concepts effectively.	SA	A	UN	D	SD
6. I am not very effective in monitoring science experiments.	SA	A	UN	D	SD
7. If students are underachieving in science, it is most likely due to ineffective science teaching.	SA	A	UN	D	SD
8. I generally teach science ineffectively.	SA	A	UN	D	SD
9. The inadequacy of a student's science background can be overcome by good teaching.	SA	A	UN	D	SD
10. The low science achievement of some students cannot generally be blamed on their teachers.	SA	A	UN	D	SD
11. When a low achieving child progresses in science, it is usually due to extra attention given by the teacher.	SA	A	UN	D	SD
12. I understand science concepts well enough to be effective in teaching elementary science.	SA	A	UN	D	SD
13. Increased effort in science teaching produces little change in some students' science achievement.	SA	A	UN	D	SD
14. The teacher is generally responsible for the achievement of students in science.	SA	A	UN	D	SD
15. Students' achievement in science is directly related to their teacher's effectiveness in science teaching.	SA	A	UN	D	SD
16. If parents comment that their child is showing more interest in science at school, it is probably due to the performance of the child's teacher.	SA	A	UN	D	SD
17. I find it difficult to explain to students why science experiments work.	SA	A	UN	D	SD
18. I am typically able to answer students' science questions.	SA	A	UN	D	SD
19. I wonder if I have the necessary skills to teach science.	SA	A	UN	D	SD
20. Effectiveness in science teaching has little influence on the achievement of students with low motivation.	SA	A	UN	D	SD
21. Given a choice, I would not invite the principal to evaluate my science teaching.	SA	A	UN	D	SD
22. When a student has difficulty understanding a science concept, I am usually at a loss as to how to help the student understand it better.	SA	A	UN	D	SD
23. When teaching science, I usually welcome student questions.	SA	A	UN	D	SD
24. I don't know what to do to turn students on to science.	SA	A	UN	D	SD
25. Even teachers with good science teaching abilities cannot help some kids learn science.	SA	A	UN	D	SD

*In Riggs, I., & Knochs, L. (1990). Towards the development of an elementary teacher's science teaching efficacy belief instrument. *Science Education*, 74, 623-637.

APPENDIX B: Environmental Literacy Education Questionnaire (ELEQ)

Environmental Literacy Questionnaire

Demographics

1. What is your gender?

Mark only one oval.

- ☐ Female
☐ Male
☐ Prefer not to say
☐ Other: _____

2. What is your age?

Mark only one oval.

- ☐ 20-29
☐ 30-39
☐ 40-49
☐ 50-59
☐ 60 or over

3. How many years have you been in the field of education?

Mark only one oval.

- ☐ 0-2 years
☐ 3-5 years
☐ 6-10 years
☐ 11-15 years
☐ 16-20 years
☐ 21-25 years
☐ 26-30 years
☐ Over 30 years

4. What is the highest degree you have achieved from college/university?

Mark only one oval.

- ☐ Bachelor's degree
☐ Bachelor's degree plus additional units
☐ Master's degree
☐ Master's degree plus additional units
☐ Doctorate in Education (Ed. D.) or Doctorate in Philosophy (Ph. D.)

5. What is the extent of your formal science education?

Mark only one oval.

- ☐ I have taken 2 or less science courses in college and do not have a degree in a scientific field.
☐ I have taken 3 or more science courses in college and do not have a degree in a scientific field.
☐ I have my undergraduate degree in a scientific field.
☐ I have a graduate degree in a scientific field.
☐ Other: _____

6. Which best describes your position at your school?

Mark only one oval.

- ☐ Kindergarten Teacher
☐ 1st Grade Teacher
☐ 2nd Grade Teacher
☐ 3rd Grade Teacher
☐ 4th Grade Teacher
☐ 5th Grade Teacher
☐ 6th Grade Teacher
☐ 7th Grade Teacher
☐ 8th Grade Teacher
☐ 9th Grade Teacher
☐ 10th Grade Teacher
☐ 11th Grade Teacher
☐ 12th Grade Teacher
☐ Administrator

7. On average, how much total instructional time do you dedicate to teaching science each week?

Mark only one oval.

- ☐ 0-15 minutes
☐ 16-30 minutes
☐ 30-45 minutes
☐ 46-60 minutes
☐ 61-90 minutes
☐ 120-180 minutes
☐ 181-240 minutes
☐ 241-300 minutes
☐ Over 300 minutes

8. What is the enrollment of your school?

Mark only one oval.

- ☐ under 250 students
☐ 251 to 500 students
☐ over 500 students

9. How would you best describe the geographic setting of your school?

Mark only one oval.

- ☐ rural
☐ suburban
☐ urban

10. Which best describes the socio-economic status of your school?

Mark only one oval.

- ☐ Low Income (Estimated enrollment of students who qualify for Free or Reduced Lunch > 50%)
☐ Moderate Income (Estimated enrollment of students who qualify for Free or Reduced Lunch is between 20% and 50%)
☐ High Income (Estimated enrollment of students who qualify for Free or Reduced Lunch < 20%)

11. Please select any potential barriers that prevent you from teaching aspects of environmental education in your classroom. (Check all that apply)

Check all that apply.

- ☐ Instructional minutes have not been allocated to teach environmental education.
☐ Your school site or district administrators prevents you from taking students outside to learn.
☐ There is no curriculum provided by your district that contains some elements of environmental education.
☐ None of the above potential barriers apply to my situation.

Other: ☐ _____

Environmental Identity

Please indicate the extent to which each of the following statements describes you by using the appropriate number from the scale below.

12. I spend a lot of time in natural settings (woods, mountains, desert, lakes, ocean).

Mark only one oval.

1 2 3 4 5
Strongly Disagree ☐ ☐ ☐ ☐ ☐ Strongly Agree

13. Engaging in environmental behaviors is important to me.

Mark only one oval.

1 2 3 4 5
Strongly Disagree ☐ ☐ ☐ ☐ ☐ Strongly Agree

14. I think of myself as a part of nature, not separate from it.

Mark only one oval.

1 2 3 4 5
Strongly Disagree ☐ ☐ ☐ ☐ ☐ Strongly Agree

15. If I had enough time or money, I would certainly devote some of it to working for environmental causes.

Mark only one oval.

1 2 3 4 5
Strongly Disagree ☐ ☐ ☐ ☐ ☐ Strongly Agree

20. I feel that I have a lot in common with other species.

Mark only one oval.

1 2 3 4 5
Strongly Disagree ☐ ☐ ☐ ☐ ☐ Strongly Agree

21. I like to garden.

Mark only one oval.

1 2 3 4 5
Strongly Disagree ☐ ☐ ☐ ☐ ☐ Strongly Agree

22. Being a part of the ecosystem is an important part of who I am.

Mark only one oval.

1 2 3 4 5
Strongly Disagree ☐ ☐ ☐ ☐ ☐ Strongly Agree

23. I feel that I have roots to a particular geographical location that had a significant impact on my development.

Mark only one oval.

1 2 3 4 5
Strongly Disagree ☐ ☐ ☐ ☐ ☐ Strongly Agree

16. When I am upset or stressed, I can feel better by spending some time outdoors "communing with nature".

Mark only one oval.

1 2 3 4 5
Strongly Disagree ☐ ☐ ☐ ☐ ☐ Strongly Agree

17. Living near wildlife is important to me; I would not want to live in a city all the time.

Mark only one oval.

1 2 3 4 5
Strongly Disagree ☐ ☐ ☐ ☐ ☐ Strongly Agree

18. I have a lot in common with environmentalists as a group.

Mark only one oval.

1 2 3 4 5
Strongly Disagree ☐ ☐ ☐ ☐ ☐ Strongly Agree

19. I believe that some of today's social problems could be cured by returning to a more rural lifestyle in which people live in harmony with the land.

Mark only one oval.

1 2 3 4 5
Strongly Disagree ☐ ☐ ☐ ☐ ☐ Strongly Agree

24. Behaving responsibly toward the earth -- living a sustainable lifestyle -- is part of my moral code.

Mark only one oval.

1 2 3 4 5
Strongly Disagree ☐ ☐ ☐ ☐ ☐ Strongly Agree

25. Learning about the natural world should be an important part of every child's upbringing.

Mark only one oval.

1 2 3 4 5
Strongly Disagree ☐ ☐ ☐ ☐ ☐ Strongly Agree

26. In general, being part of the natural world is an important part of my self-image.

Mark only one oval.

1 2 3 4 5
Strongly Disagree ☐ ☐ ☐ ☐ ☐ Strongly Agree

27. I would rather live in a small room or house with a nice view than a bigger room or house with a view of other buildings.

Mark only one oval.

1 2 3 4 5
Strongly Disagree ☐ ☐ ☐ ☐ ☐ Strongly Agree

44. I do not know how to motivate students about environmental concepts.

Mark only one oval.

	1	2	3	4	5	6
Strongly Disagree	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Strongly Agree						

45. In spite of my best efforts, I cannot teach about the environment as well as I can teach about other topics.

Mark only one oval.

	1	2	3	4	5	6
Strongly Disagree	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Strongly Agree						

46. I can find effective ways to teach about the environment.

Mark only one oval.

	1	2	3	4	5	6
Strongly Disagree	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Strongly Agree						

47. Given a choice, I will not invite the principal to evaluate my environmental education teaching.

Mark only one oval.

	1	2	3	4	5	6
Strongly Disagree	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Strongly Agree						

48. When teaching about the environment, I encourage student questions.

Mark only one oval.

	1	2	3	4	5	6
Strongly Disagree	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Strongly Agree						

49. When students' grades in environmental education improve, it is due to their teacher using effective teaching strategies.

Mark only one oval.

	1	2	3	4	5	6
Strongly Disagree	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Strongly Agree						

50. When an individual student's academic achievement improves in environmental education, it is due to extra attention by the teacher.

Mark only one oval.

	1	2	3	4	5	6
Strongly Disagree	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Strongly Agree						

51. When students do better than usual in environmental education (EE), it is because the teacher exerted extra effort in teaching environmental concepts.

Mark only one oval.

	1	2	3	4	5	6
Strongly Disagree	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Strongly Agree						

52. If parents comment that their child is showing more interest about the environment, it is due to effective teaching by the child's teacher.

Mark only one oval.

	1	2	3	4	5	6
Strongly Disagree	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Strongly Agree						

53. If students do not understand environmental concepts, it is due to ineffective teaching.

Mark only one oval.

	1	2	3	4	5	6
Strongly Disagree	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Strongly Agree						

54. The teachers is responsible for students' understanding of environmental concepts.

Mark only one oval.

	1	2	3	4	5	6
Strongly Disagree	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Strongly Agree						

55. Increased effort in teaching environmental concepts produces positive change in students' academic achievement.

Mark only one oval.

	1	2	3	4	5	6
Strongly Disagree	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Strongly Agree						

The next series of questions are on a Likert scale of 0-7 of continuous response. The marks indicate increasing strength of your response. The questions pertain to concerns regarding the teaching and learning of California's Environmental Principles & Concepts (EP&Cs). Some of the questions may sound strange because the questions are designed to cover a wide range of experience. If a question does not apply to you at this point, mark the question as being Irrelevant. Please answer all the questions.

56. I am concerned about students' attitudes toward this innovation.

Check all that apply.

- ☐ 0 - Irrelevant
☐ 1 - Not true of me
☐ 2 - A little true of me
☐ 3
☐ 4 - Somewhat true of me
☐ 5
☐ 6
☐ 7 - Very true of me

57. I now know of some other approaches that might work better.

Check all that apply.

- ☐ 0 - Irrelevant
☐ 1 - Not true of me
☐ 2 - A little true of me
☐ 3
☐ 4 - Somewhat true of me
☐ 5
☐ 6
☐ 7 - Very true of me

Stages of
Concern

The term "innovation" in the following questions refers to the teaching of California's EP&Cs

58. I am more concerned about another innovation.

Check all that apply:

- ☐ 0 - Irrelevant
☐ 1 - Not true of me
☐ 2 - A little true of me
☐ 3
☐ 4 - Somewhat true of me
☐ 5
☐ 6
☐ 7 - Very true of me

59. I am concerned about not having enough time to organize myself each day.

Check all that apply:

- ☐ 0 - Irrelevant
☐ 1 - Not true of me
☐ 2 - A little true of me
☐ 3
☐ 4 - Somewhat true of me
☐ 5
☐ 6
☐ 7 - Very true of me

60. I would like to help other faculty in their use of the innovation.

Check all that apply:

- ☐ 0 - Irrelevant
☐ 1 - Not true of me
☐ 2 - A little true of me
☐ 3
☐ 4 - Somewhat true of me
☐ 5
☐ 6
☐ 7 - Very true of me

64. I am concerned about revising my use of the innovation.

Check all that apply:

- ☐ 0 - Irrelevant
☐ 1 - Not true of me
☐ 2 - A little true of me
☐ 3
☐ 4 - Somewhat true of me
☐ 5
☐ 6
☐ 7 - Very true of me

65. I would like to develop working relationships with both our faculty and outside faculty using this innovation.

Check all that apply:

- ☐ 0 - Irrelevant
☐ 1 - Not true of me
☐ 2 - A little true of me
☐ 3
☐ 4 - Somewhat true of me
☐ 5
☐ 6
☐ 7 - Very true of me

66. I am concerned how the innovation affects students.

Check all that apply:

- ☐ 0 - Irrelevant
☐ 1 - Not true of me
☐ 2 - A little true of me
☐ 3
☐ 4 - Somewhat true of me
☐ 5
☐ 6
☐ 7 - Very true of me

61. I have a very limited knowledge of the innovation.

Check all that apply:

- ☐ 0 - Irrelevant
☐ 1 - Not true of me
☐ 2 - A little true of me
☐ 3
☐ 4 - Somewhat true of me
☐ 5
☐ 6
☐ 7 - Very true of me

62. I would like to know the effect of reorganization on my professional status.

Check all that apply:

- ☐ 0 - Irrelevant
☐ 1 - Not true of me
☐ 2 - A little true of me
☐ 3
☐ 4 - Somewhat true of me
☐ 5
☐ 6
☐ 7 - Very true of me

63. I am concerned about conflict between my interests and my responsibilities.

Check all that apply:

- ☐ 0 - Irrelevant
☐ 1 - Not true of me
☐ 2 - A little true of me
☐ 3
☐ 4 - Somewhat true of me
☐ 5
☐ 6
☐ 7 - Very true of me

67. I am not concerned about this innovation at this time.

Check all that apply:

- ☐ 0 - Irrelevant
☐ 1 - Not true of me
☐ 2 - A little true of me
☐ 3
☐ 4 - Somewhat true of me
☐ 5
☐ 6
☐ 7 - Very true of me

68. I would like to know who will make the decisions in the new system.

Check all that apply:

- ☐ 0 - Irrelevant
☐ 1 - Not true of me
☐ 2 - A little true of me
☐ 3
☐ 4 - Somewhat true of me
☐ 5
☐ 6
☐ 7 - Very true of me

69. I would like to discuss the possibility of using the innovation.

Check all that apply:

- ☐ 0 - Irrelevant
☐ 1 - Not true of me
☐ 2 - A little true of me
☐ 3
☐ 4 - Somewhat true of me
☐ 5
☐ 6
☐ 7 - Very true of me

70. I would like to know what resources are available, if we decide to adopt this innovation.

Check all that apply.

- ☐ 0 - Irrelevant
☐ 1 - Not true of me
☐ 2 - A little true of me
☐ 3
☐ 4 - Somewhat true of me
☐ 5
☐ 6
☐ 7 - Very true of me

71. I am concerned about my inability to manage all the innovation requires.

Check all that apply.

- ☐ 0 - Irrelevant
☐ 1 - Not true of me
☐ 2 - A little true of me
☐ 3
☐ 4 - Somewhat true of me
☐ 5
☐ 6
☐ 7 - Very true of me

72. I would like to know how my teaching or administration is supposed to change.

Check all that apply.

- ☐ 0 - Irrelevant
☐ 1 - Not true of me
☐ 2 - A little true of me
☐ 3
☐ 4 - Somewhat true of me
☐ 5
☐ 6
☐ 7 - Very true of me

76. I am preoccupied with things other than this innovation.

Check all that apply.

- ☐ 0 - Irrelevant
☐ 1 - Not true of me
☐ 2 - A little true of me
☐ 3
☐ 4 - Somewhat true of me
☐ 5
☐ 6
☐ 7 - Very true of me

77. I would like to modify our use of the innovation based on the experiences of our students.

Check all that apply.

- ☐ 0 - Irrelevant
☐ 1 - Not true of me
☐ 2 - A little true of me
☐ 3
☐ 4 - Somewhat true of me
☐ 5
☐ 6
☐ 7 - Very true of me

78. I spend little time thinking about this innovation.

Check all that apply.

- ☐ 0 - Irrelevant
☐ 1 - Not true of me
☐ 2 - A little true of me
☐ 3
☐ 4 - Somewhat true of me
☐ 5
☐ 6
☐ 7 - Very true of me

73. I would like to familiarize other departments or people with the progress of this new approach.

Check all that apply.

- ☐ 0 - Irrelevant
☐ 1 - Not true of me
☐ 2 - A little true of me
☐ 3
☐ 4 - Somewhat true of me
☐ 5
☐ 6
☐ 7 - Very true of me

74. I am concerned about evaluating my impact upon students.

Check all that apply.

- ☐ 0 - Irrelevant
☐ 1 - Not true of me
☐ 2 - A little true of me
☐ 3
☐ 4 - Somewhat true of me
☐ 5
☐ 6
☐ 7 - Very true of me

75. I would like to revise the innovation's instructional approach.

Check all that apply.

- ☐ 0 - Irrelevant
☐ 1 - Not true of me
☐ 2 - A little true of me
☐ 3
☐ 4 - Somewhat true of me
☐ 5
☐ 6
☐ 7 - Very true of me

79. I would like to excite my students about their part in this approach.

Check all that apply.

- ☐ 0 - Irrelevant
☐ 1 - Not true of me
☐ 2 - A little true of me
☐ 3
☐ 4 - Somewhat true of me
☐ 5
☐ 6
☐ 7 - Very true of me

80. I am concerned about the time spent working with nonacademic problems related to this innovation.

Check all that apply.

- ☐ 0 - Irrelevant
☐ 1 - Not true of me
☐ 2 - A little true of me
☐ 3
☐ 4 - Somewhat true of me
☐ 5
☐ 6
☐ 7 - Very true of me

81. I would like to know what the use of this innovation would require in the immediate future.

Check all that apply.

- ☐ 0 - Irrelevant
☐ 1 - Not true of me
☐ 2 - A little true of me
☐ 3
☐ 4 - Somewhat true of me
☐ 5
☐ 6
☐ 7 - Very true of me

82. I would like to coordinate my effort with others to maximize the innovation's effects.

Check all that apply.

- ☐ 0 - Irrelevant
☐ 1 - Not true of me
☐ 2 - A little true of me
☐ 3
☐ 4 - Somewhat true of me
☐ 5
☐ 6
☐ 7 - Very true of me

83. I would like to have more information on time and energy commitments required by this innovation.

Check all that apply.

- ☐ 0 - Irrelevant
☐ 1 - Not true of me
☐ 2 - A little true of me
☐ 3
☐ 4 - Somewhat true of me
☐ 5
☐ 6
☐ 7 - Very true of me

84. I would like to know what other faculty are doing in this area.

Check all that apply.

- ☐ 0 - Irrelevant
☐ 1 - Not true of me
☐ 2 - A little true of me
☐ 3
☐ 4 - Somewhat true of me
☐ 5
☐ 6
☐ 7 - Very true of me

88. I would like to know how my role will change when I am using the innovation.

Check all that apply.

- ☐ 0 - Irrelevant
☐ 1 - Not true of me
☐ 2 - A little true of me
☐ 3
☐ 4 - Somewhat true of me
☐ 5
☐ 6
☐ 7 - Very true of me

89. Coordination of tasks and people is taking too much of my time.

Check all that apply.

- ☐ 0 - Irrelevant
☐ 1 - Not true of me
☐ 2 - A little true of me
☐ 3
☐ 4 - Somewhat true of me
☐ 5
☐ 6
☐ 7 - Very true of me

90. I would like to know how this innovation is better than we have now.

Check all that apply.

- ☐ 0 - Irrelevant
☐ 1 - Not true of me
☐ 2 - A little true of me
☐ 3
☐ 4 - Somewhat true of me
☐ 5
☐ 6
☐ 7 - Very true of me

85. Currently, other priorities prevent me from focusing my attention on this innovation.

Check all that apply.

- ☐ 0 - Irrelevant
☐ 1 - Not true of me
☐ 2 - A little true of me
☐ 3
☐ 4 - Somewhat true of me
☐ 5
☐ 6
☐ 7 - Very true of me

86. I would like to determine how to supplement, enhance, or replace the innovation.

Check all that apply.

- ☐ 0 - Irrelevant
☐ 1 - Not true of me
☐ 2 - A little true of me
☐ 3
☐ 4 - Somewhat true of me
☐ 5
☐ 6
☐ 7 - Very true of me

87. I would like to use feedback from students to change the program.

Check all that apply.

- ☐ 0 - Irrelevant
☐ 1 - Not true of me
☐ 2 - A little true of me
☐ 3
☐ 4 - Somewhat true of me
☐ 5
☐ 6
☐ 7 - Very true of me

Levels of Use. Please read the descriptions of each of the eight stages related to the teaching of California's EP&Cs. Choose the stage that best describes where you are in the implementation of California's EP&Cs in your teaching. ☐

91. Please read the descriptions of each of the eight stages related to the teaching of California's EP&Cs. Choose the stage that best describes where you are in the implementation of California's EP&Cs.

Mark only one oval.

- ☐ Stage 1: I have little or no knowledge of California's EP&Cs.
☐ Stage 2: I am looking for information about California's EP&Cs.
☐ Stage 3: I am preparing to teach California's EP&Cs to my students.
☐ Stage 4: I am working on mastering the teaching of California's EP&Cs with little time for reflection.
☐ Stage 5: I feel comfortable teaching California's EP&Cs but have not worked on ways to improve my teaching of California's EP&Cs.
☐ Stage 6: I am comfortable teaching California's EP&Cs and am now working on ways to vary and improve my effectiveness with my students.
☐ Stage 7: I am working with fellow colleagues to improve the impact of teaching California's EP&Cs in the classroom.
☐ Stage 8: I am re-evaluating my teaching of California's EP&Cs and looking for major modifications that will help improve the learning of California's EP&Cs.
☐ Other: _____

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Appendix C: Follow-up Interview Protocol

1. What is your current teaching position for the 2022/2023 school year? How has it changed from when you were participating in the CELP program in the 2020/2021 school year?
2. Would you like to share anything about your identity, how you would describe yourself?
3. Another area that some folks see themselves connected with is the environment. If that is a part of your identity, please describe your "environmental identity."
4. Suppose a fellow teacher at your site came to you wanting information on the California Environmental Principles and Concepts also known as the California EP&Cs. How would you describe what the CA EP&Cs are to that teacher? What would you emphasize? Are there any resources you would suggest they consult for more information, beyond what you might be able to provide?
5. What were some challenges or concerns you've encountered when teaching the CA EP&Cs?
6. What motivated you to want to participate in the CELP program?
7. In what ways, if any, did your participation in the CELP program affect your environmental identity as a teacher?
8. In what ways, if any, do you feel as though your confidence in teaching about the environment were influenced by your participation in the CELP program? Which aspects do you feel more confident and less confident about?
9. In what ways, if any, did your participation in the CELP program affect your abilities to implement the CA EP&Cs in your classroom?
10. For you as a teacher, do you see any connections between your environmental identity, self-efficacy of teaching about the environment, and your implementation of CA EP&Cs in your classroom? If so, what connections or associations do you see?
11. Is there anything else that you would like to share about your environmental identity, self-efficacy of teaching about the environment or your implementation of CA EP&Cs in your classroom that I have not asked about?

Appendix D: Stated Concerns from Participants Regarding the Implementation of California's EP&Cs

80. Please describe any concerns that you may have about teaching California's EP&Cs with your students. Otherwise, if you have no concerns, please note that.

I am excited about this program. At this time, COVID has taken precedence. Once we are able to refocus our attention on teaching (and not surviving teaching in a pandemic) I look forward to better implementation.

We have limited training on all the other initiatives we are already asked to do. How will this be any different?

Just getting them outside in nature.

I have been with EP&Cs since the early 2000s when we were first field testing. No concerns, very excited about collaboration between outside EE providers and COE and classroom colleagues and UCSC - great team work and NGSS coordination has developed overtime with knowledgeable and flexible leadership and guidance.

I feel like I am not the best person to answer this question. My teaching assignment is mostly chemistry. Every year 5/6 of my classes are either chemistry or AP Chemistry, but the other class I teach is AP Environmental Science. Even in chemistry class, I bring in environmental topics, but I am not sure they are the EP&C's since I am not sure what those are. I attended one training through the COE, but I don't feel like I am party of a big environmental literacy team...But if the question is just about teaching environmental topics in my class, the answer is I don't really have any concerns except the fact that sometimes it is hard to make the connection with certain chemistry topics.

Na

Right now, how to do these kinds of BIG projects with kids at home. (We have 100 trees coming and I still can't wrap my head around how I am going to get them to the families to get new understory trees planted to replace some of the trees burned in our CZU fire.) I know kids get excited when it is real world, it is tricky right now.

Only concern is available time

I just wish there was more time(in the school day) to get all my students off site (130 + students)

I think I am concerned about teaching the EP&Cs regularly

Finding time is always the issue, as well as transportation (once we can even use buses again)

How does this overlap/intersect with NGSS?

no concerns

I am concerned that science is the ONLY class that "knows" about these standards. It would be NICE to discuss and collaborate with history or english teachers to facilitate learning across disciplines.

I don't have any concerns

I am concerned that I may fall back into old habits and ineffective methods of teaching Science, especially after a year of Zoom teaching where it hasn't felt interactive. I am also concerned about having the necessary time to prep and plan and implement the lessons effectively. The prep and clean-up and planning for really good science lessons takes a lot of time that most teachers don't have.

no concerns - just have a lot going on and trying to check one more box while lesson planning is very difficult. I am able to easily incorporate the EP&Cs in my Environmental Science course, but it requires more intentional planning in my General Biology course

At this time, we don't have a group of resources or a curriculum that would enable teachers to teach EP&Cs effectively.

more curriculum needed

Including it in the current curriculum

Distance Learning makes it difficult to reach all students and meet their needs.

No Concerns

I have no concerns

Time constraints

I have no concerns about teaching California's EP&Cs.

Time is the biggest issue we have. We have just a small time for science, let alone the EP&Cs. Integrating them into ELA will be a helpful way to incorporate them and find the time.

No concerns, I think if we all come together I think we can come up with the best practices to teach our students effectively

Maybe finding resources to help draw in the younger ages. Starting young and developing a true love for the environment will help boost interest. Many resources I've found are either way too easy (which makes it uninteresting) or way too hard (unattainable)

No concern.

time during covid-hybrid teaching

No concerns at this time

NA

No concerns

No concerns. A natural for middle school science.

No Concerns

No concerns

Biggest concerns - access to quality nature areas for all students and lack of district support

My concerns have already been addressed.

No concerns

No concerns.

None at this time.

I would like to see more teachers aware of it and how to use it in the classroom.

No Concerns.

Time constraints and my health are some of the reasons that hinder me in teaching California's EP&C

Unable to carry out the hands on activities during covid.

District support - approved to extend on curriculum

I think one challenge may be getting more teachers in my district and at my site on board with integrating the EP&Cs into our classrooms. Many teachers I know don't seem to be familiar with the standards or know that they are part of California's educational framework. For me and my own teaching circumstances, I have no concerns. I just want to be able to share what I've learned with others in my district and I'm still figuring out the best approach for doing that.
No concerns
I'm concerned about intergrating the EPCs in my already full schedule.
No concerns, it is our due diligence as educators to also implement Environmental Literacy to our students for their future generations.
no concerns
No concerns
no concerns
My largest concern is that I do not have the skills to impart an appreciation and understanding of the EP&Cs.
My biggest concern is learning how to incorporate the EP&Cs with the other standards so that we can be efficient with using the time we have with science.
The only concern is parent pushback when it comes to concepts that have been framed as "liberal" or "conservative".
no concerns, just going to do my best
Finding outdoor local spaces that are easy to travel to that do not pose any liabilities to the school or costs. The only outdoor space is the soccer fields-that really limits what we can cover. We have great canyons & lagoons nearby, but I cannot figure out the logistics or how to get the students there with approval from the district (when COVID ends) next school year.
Looking for more guidance for how to integrate it with what we already do
No concerns at this time. I am not in person teaching yet.
This is my first year teaching science full time and I have a strong personal/moral connection to the ideas of the EP&Cs. I 100% want to teach the concepts to my students and have them make responsible decisions for our environment. The County Office of Ed program is the first time I've ever heard of the EP&Cs, so while I deeply care about teaching them, I have little experience with them.