ENVIRONMENTAL EDUCATION IN OREGON: ARTICULATING LINKAGES BETWEEN THE PROJECT LEARNING TREE ACTIVITY GUIDE AND THE OREGON ENVIRONMENTAL LITERACY PLAN

by

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The goal of this project is to cross-walk the forty-six lessons with a Language Arts focus from the Project Learning Tree (PLT) *Environmental Education Activity Guide* to the concepts and practices expressed in the five environmental literacy strands found in the most recent Oregon Environmental Literacy Plan (OELP). In order to determine the ability of the lessons to align with the OELP, I compared them individually to the details of the five literacy strands and then organized the results into tables. While all of the lessons can be used to teach environmental education (EE), some more strongly promote the objectives of environmental literacy as outlined in the OELP than others.

The political framework of EE and the literature regarding interdisciplinary approaches, specifically in Language Arts, frame my research in a way that shows the importance and growing need for EE today, as well as why and how to integrate it into already existing curricula in Oregon across core subjects. I specifically chose PLT lessons with a Language Arts focus in order to demonstrate how EE should be taught interdisciplinary, not just in the natural sciences, and how extending into these other

subjects expands perspectives about the environment. The results of my comparison explain how the elements of each lesson plan link to the OELP strands. I also produce units for teachers to use in EE that effectively articulate the goals and objectives set forth in the literacy plan. Utilizing the PLT curriculum both inside and outside of the classroom has the power to encourage and develop all of the components of environmental literacy, and is an extremely valuable tool in the important development of environmental literacy across Oregon.

Acknowledgements

I sincerely thank Professor Lynch for her enduring support throughout this long process and for being so encouraging, regardless of how many times I changed my research question. I am genuinely grateful for all of her advice on how to present and organize my ideas clearly and produce useful and professional results. I am also appreciative for Professor Lynch's confidence in me as a student to excel and her willingness to help bear many of the difficulties I faced during this project. I also thank Professor Fracchia for his guidance through this strenuous but rewarding process. He continuously offered encouragement when I doubted my abilities and gave me advice on how to keep myself focused and level headed over the course of the past year. I also acknowledge Alicia Kristen for her willingness to take on the responsibility of second reader even with her overwhelmingly busy schedule and for pushing me to utilize the skills I already had in regards to Project Learning Tree and environmental literacy. I am also very thankful for the help of Susan Sahnow, the director of the Oregon Natural Resources Education Program. Her expert feedback regarding my work was extremely helpful in ensuring that my research would be beneficial to professionals in this field.

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List of Abbreviations

AFI: American Forest Institute

BSSR: Bureau of School Service and Research

EE: Environmental Education

EPA: Environmental Protection Agency

NAAEE: North American Association for Environmental Education

NCLB: No Child Left Behind

NCLI: No Child Left Inside

NOCLI: No Oregon Child Left Inside

OEE: Office of Environmental Education

OELP: Oregon Environmental Literacy Plan

PLT: Project Learning Tree

UNEP: United Nations Environment Programme

UNESCO: United Nations Educational, Scientific, and Cultural Organization

WREEC: Western Regional Environmental Education Council

Introduction

As far back as I can remember I loved being outdoors with my friends and family, my curiosity guiding me through places of wonder and awe. My strongest childhood memories consist of dirt under my fingernails, scratches on my legs from the spiny wineberry bushes, and grass stains on the back pockets of my shorts. My mother would clip a walkie-talkie onto my backpack filled with snacks, water, a magnifying glass and binoculars, and send me off into the woods for hours. Every now and then she would radio to check in on me, and my response was always, "Yes mom, I'm wonderful. See you when the sun sets." The woods and stream in my neighborhood was the best playground I could ask for. I was what Robert Michael Pyle calls a "free range kid"[1]. As I have become older and more educated, I have gained an even greater appreciation and understanding of the complex relationship between humans and the natural world. The backyard and the wilderness have somewhat shifted for me from being a purely magical and mysterious place, to being in desperate need of my active protection. Educating children about the environment seems like a perfect place to start.

Communities need to work collaboratively to ensure that children are provided with the knowledge, skills and experiences necessary to tackle both current and future environmental problems. The prominence of technology and the continuing urbanization of the 21st century have created a dangerous separation between *Homo sapiens* and the natural world. Younger generations, including my own, who are

[1]Robert Michael Pyle. "Free-Range Kids." *Orion Magazine* (Massachusetts: Myrin Institute, Nov/Dec 2014) 49.

increasingly disengaged and separated from their local natural environments, exhibit symptoms of "nature-deficit disorder".[2] Richard Louv suggests that with rising levels of ADD/ADHD, obesity, depression, and muted creativity, nature-deficit disorder will accelerate if not immediately and holistically addressed.

In Louv's influential work, *Last Child in the Woods*, he argues for strong connections between the young and nature as a remedy for nature-deficit disorder:

> Passion does not arrive on videotape or on a CD; passion is personal. Passion is lifted from the earth itself by the muddy hands of the young; it travels along grass-stained sleeves to the heart. If we are going to save environmentalism and the environment, we must also save an endangered indicator species: the child in nature.[3]

He reminds us that we always have a choice as to our role in earth's story and how we must not wait for more, needed, research to act on common sense, or to give the gift of nature.[4] Nature has the ability to inspire us, teach us, and transform our lives. By giving all children the chance to explore the natural world, we allow them to experience the countless stories nature has to offer. By utilizing place-based lessons and hands-on activities, environmental education can help students acquire ecological awareness and greater understanding of natural processes. Infusing primary and secondary school curricula with environmental themes and concepts has proven to foster stewardship and improve support for conservation.[5]

The bond I feel with the natural world was formed at a very early age; it has made me who I am today and it is why I am writing this thesis. Our children, the

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[2] Richard Louv. *Last Child In The Woods: Saving Our Children From Nature-deficit Disorder*. (Chapel Hill, NC: Algonquin Books Of Chapel Hill, 2005).
[3] Louv, 159.
[4] Louv, 110.
[5] Susan K. Jacobson, et al. *Conservation Education and Outreach Techniques*. (Oxford: Oxford University Press, 2006), 10.

citizens of tomorrow, will need a strong understanding and knowledge as well as a personal connection with the environment to be prepared for the most pressing and yet unforeseen environmental problems. Children need environmental education, in all its various forms from conservation education to experiential learning, to provide them these opportunities to learn and connect. Programs like Project Learning Tree, a curriculum created by the American Forest Institute, provide teachers with easily accessible tools and training for teaching EE. They offer students an interdisciplinary approach to learning about important environmental concepts and their place in the world.

Research Design and Questions

This thesis connects lesson in the *Project Learning Tree* (PLT) *Environmental Education Activity Guide* that have a Language Arts focus and the five Environmental Literacy Strands of the Oregon Environmental Literacy Plan (OELP) in order to help Oregon educators see how the content they are teaching promotes environmental literacy. I organize forty-six PLT lessons according to how they integrated concepts and practices from the OELP strands. I also provide suggestions on how to group together lessons to reach all five strands in a cohesive teaching unit.

I began by identifying the lesson in the PLT guide that included a Language Arts focus by using the subject index in the appendix. I chose Language Arts lessons because they offer a new perspective on EE; in the interdisciplinary EE section I go into more detail. After recording all forty-six lessons that included Language Arts, I read through and annotated each one in order to familiarize myself with the concepts and objectives of the lesson. I also read through the OELP to verse myself in the importance of

environmental literacy in Oregon and to ensure I understood each of the five strands. Then, I made a table including all of the lessons, by name and number, with columns detailing their alignment to the OELP strands.

For each of the forty-six lessons I evaluated, I examined each lesson to see if it included activities that would encourage and incorporate the five strands. Each of the strands has subcategories, and within the subcategories are detailed explanations of what make up that strand. To determine if the lessons articulated the strands, I turned each subcategory within the strand into questions and looked to see if the lesson could answer them. For example, strand one requires that the activities encourage students to develop systems thinking. When I look at each lesson, I asked the question, does the lesson discuss complex systems that are made up of smaller subsystems? Does the lesson discuss how the relationship between the parts of a system determines its outcomes and behaviors? After I went through each detail in the strand, I calculated the percentage of yeses versus nos. If more than half of the questions answered yes, I determined that the lesson did articulate the concepts and processes and addressed that specific strand. I carried out this same process for each of the five strands. I have provided a partial example of my process in the table below for lesson #9 Planet Diversity, strand two:

Table 1: PLT lesson evaluation rubric

Strand 2) Physical, living and human systems	OELP Subcategories as questions	Answer	Final Result
Subcategory a. Structure, function, interaction and change in physical systems: atmosphere, geosphere, hydrosphere, properties of energy, cycling of matter and energy between system components, evidence for changes over time, climate, influence of oceans	1.Does the lesson discuss the atmosphere, geosphere, or hydrosphere? 2.Does it discuss the properties of energy? 3.Does it discuss the cycling of matter? 4.Does it show evidence for changes over time? 5.Does it discuss the climate? Oceans?	1. No 2. No 3. No 4. Yes; environmental changes over time that affect biodiversity 5. Yes; ecological diversity in different climates, how the climate can affect the abundance of biodiversity in an area	No, did not articulate physical systems (3/5 NO) (2/5 YES)
Subcategory b. Structure, function, interaction and change in living systems: structure and function of organisms, populations, communities, ecosystems and biomes, principles of ecology, evolution, species change, natural selection, matter and energy flow in organisms, interdependence of plants, animals and the environment	1.Does the lesson discuss the structure and function of organisms, populations, communities, ecosystems and biomes? 2.Does it discuss the principles of ecology? 3.Does it discuss evolution, species change, or natural selection? 4.Does it show the interdependence of plants, animals and the environment?	1. Yes; structure of mini-ecosystems, the organisms within them, and examines diversity within biomes 2. Yes; discusses biodiversity, carry capacity, population dynamics, and ecosystem change on Earth and Planet Devoid 3. Yes; evolution and natural selection are key components of biodiversity 4. Yes; examines how different adaptations influence survival and how the plants and animals in a small plot of land depend on each other for survival	Yes, did articulate living systems. (4/4 YES)

I faced some difficulty when reviewing certain lessons because the answers to the questions were sometimes subjective; not all of the questions could be answered explicitly yes or no. In this situation, I used my best judgment as an environmental educator. If a lesson did not explicitly address a strand, but had some potential to do so, or was unclear if it did, I chose to take the conservative path and did not include it in my list.

Finally, I provide some recommendations on how to put together some of the 46 lessons into cohesive units for teachers to use based on grade level, concepts covered, and strands reached. To fully instill environmental literacy, however, these units work best when used in conjunction with other PLT lessons outside of the Language Arts focus.

Limitations

The difficulty I faced cat walking the PLT lessons to the OELP strands was the biggest limitation of this study. For each lesson, I attempted to eliminate my personal opinions and judgments to ensure that the results I created were as unbiased as possible. Unfortunately, because all the details of the strands cannot be obviously recognized in the lessons, it is impossible to remove researcher bias completely. If this same study were to be carried out by another researcher, some lessons may show different abilities in articulating or not articulating the OELP strands based on the researcher's best judgment. Another limitation of this study is only looking at Language Arts focused lessons. Since EE is most effective when it is taught interdisciplinary, all subjects in the activity guide should be reviewed based on the OELP. An evaluation of all ninety-six lessons in the activity guide would provide more conclusive results on the ability of

PLT to be used in teaching for environmental literacy in Oregon. The last limitation of this study has to do with the Project Learning Tree program itself. Since this is a national organization that provides teaching materials to be used in all fifty states, it is not specifically tailored to address the plan's goals and concerns for environmental literacy in Oregon. The broad scope of PLT lessons limits their ability to tackle particular state needs, and instead focuses on more commonly found and shared environmental concepts and issues.

Rationale

I chose to evaluate PLT for multiple reasons: it is one of the most widely accessible tools for teaching EE, existing in all 50 states; more than 500,000 trained educators use it; it is supported by the North American Association for Environmental Education; and it reaches state and national learning standards. [6] In addition, I have personal experience working with the curriculum through my yearlong participation in the Environmental Leadership Program at the University of Oregon. Given that PLT is such a highly accredited resource for environmental educators across the country, I wanted to see how it aligns with the Oregon environmental literacy strands. I specifically analyzed the lessons that had a focus on Language Arts in order to reach a wider audience of teachers, beyond those that are already comfortable teaching scientific and environmental concepts. I also wanted to look at Language Arts focused lessons because there is a significant amount of research that discusses how reading and studying literature can lead to new perspectives about the environment and foster

[6] Project Learning Tree: Empowering Educators, Inspiring Youth. (American Forest Foundation, 2010. Web)

connections to place.[7] As a result of this thesis, educators in Oregon, both experienced in EE and new to the practice, will now have a guide of PLT lessons organized according to the environmental literacy strands that can be applied to pre-Kindergarten through 8th grade classrooms and learning environments.

Project Learning Tree

Project Learning Tree (PLT) is an environmental education activity guide for students pre-K to 8th grade. It provides educators with EE curriculum resources and lesson plans for visual arts, language arts, math, physical education, science, social studies, and performing arts and strives to teach students how to think, not what to think, about complex environmental issues.[8] PLT also aims to provide students with the skills they need to make responsible decisions about the environment.

Natural resource managers and educators from the American Forest Institute (AFI) and Western Regional Environmental Education Council (WREEC) developed PLT in 1976. They formed a partnership to develop a program for elementary and secondary students and their teachers. [9] The AFI wrote a grant to WREEC for the development of an interdisciplinary curriculum. WREEC then partnered with an educational consulting firm, Education/Research Systems, Inc. (E/RS) in Seattle, Washington to manage the development of the program. The E/RS conducted work sessions with industry, government agency personnel and educators to develop the theme and structure of the program and created an overall goal to,

[7] Lundahl, 44.
[8] American Forest Foundation, 2.
[9] Rudy Schafer. "Planting the Seed: Perspectives from a Project Learning Tree Pioneer." *Forest History Today*. (North Carolina: Forest History Society, 2007) 31.

> develop an awareness of our interdependence with the forest, the use of its resources, and knowledge of the scientific, technological, social, aesthetic, and ethical factors relating to this interdependency.[10]

Subsequent workshops were held that developed the curriculum framework and teaching activities. These workshops included representatives ranging from college professors, superintendents, industry and conservation organizations, and federal and state agencies to give the program a more balanced, unbiased character.[11] They completed manuals by February 1975 that provided over 100 activities to supplement the curriculum in social studies, science, mathematics, and language arts.

Four workshops were held in the spring of 1975 to introduce a few teachers and administrators in Washington, Idaho, Wyoming and California to the project, now officially called Project Learning Tree. An advisory council to the project was established in order to develop and execute classroom evaluations of the program and consisted of three members from WREEC, three from industry and an AFI staff member responsible for the education program.[12] This council selected a project director for PLT who would be responsible for implementing PLT across America, evaluating and selecting teachers to take part in the program, and revising and editing manuals. In order to formally evaluate the program, the Bureau of School Service and Research (BSSR) was contracted to test the activities in the manuals with students to determine if they reached the objectives set.[13] BSSR selected eleven core lessons that

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[10] June McSwain. "Project Learning Tree." Environmental Education in Action I: Case Studies of Selected Public School and Public Action Programs, edited by Clay Schoenfeld and John Disinger, 245-253. (Columbus, Ohio: ERIC Information Analysis Center for Science, Mathematics, and Environmental Education, April 1977) 246.

[11] McSwain, 246.
[12] McSwain, 248.
[13] McSwain, 249

covered multiple subject areas and utilized different skills and teaching modes. The teachers involved in the evaluation of the program taught all core lessons for their respective grade levels and conducted tests, which were returned to BSSR for evaluation.[14] Teachers were also asked to document their reaction to the activities with suggestions for changes. In order to determine the effectiveness of the program based on the tests, two groups of teachers, a control group and a treatment group, were organized; the control group never used PLT with their students but were given the same tests as the students who had.[15] These tests gave BSSR, WREEC, and AFI valuable information about what parts of PLT were successful, and what parts needed further revisions. All PLT materials went through an extensive process of writing, testing, and retesting;[16] evaluations like these continue to take place as the program grows.

PLT went international in 1980 when Canada adopted the program and by the end of the decade it had reached 49 different states in America. In 1990, the curriculum was revised; more than 300 people participated in writing workshops to revamp the content, and another 300 educators participated in a pilot test, field test and formal evaluation of the materials.[17] In 1993, a new PreK-8 curriculum was released. By the next year, PLT was being taught in all 50 states in America. In 2005, the *PreK-8 Environmental Education Activity Guide*, the book I analyzed, underwent another major revision to address education reform and the most pressing and up-to-date environmental issues, such as habitat protection and restoration, invasive species,

[14] McSwain, 249.
[15] McSwain, 249.
[16] Rudy Schafer, 34.
[17] PLT, web.

community planning, and culture.[18] PLT continues to evolve to ensure it meets students and educators needs, and has grown into a network of 3,000 active volunteers and state coordinators that have trained more than 500,000 educators.[19] They hold new workshops nearly every week to provide educators with the tools and training they need to bring EE into their classrooms.

PLT education materials are designed to meet components of national education reform and state learning standards. Specifically, the curriculum has been correlated to the Common Core State Standards, National Science Standards, National Social Studies Standards, Excellence in EE Guidelines, and Girl Scout program activities.[20] The book I analyzed, *PreK-8 Environmental Education Activity Guide*, covers topics in both the natural and built environment including forests, wildlife, water, energy, waste management, climate change, community planning, and culture.[21] The materials also include interdisciplinary activities to reach specific grade levels and learning objectives. Teachers are given tools to bring the environment into their classrooms and their classrooms into the environment.

Critique of PLT

While PLT is a highly accredited and successful curriculum guide for teaching EE, there are some critiques that should be acknowledged. It is important to recognize that the funding for PLT comes from timber industries, the American Forest Institute and its successor, American Forest Foundation. Because of this funding, vital

[18] PLT, web.
[19] PLT, web.
[20] PLT, web.
[21] American Forest Foundation, 2-3.

information on the topic of forests, forest management and protection, and timber as a resource are skewed or ignored, also referred to as 'sin of omission'. The PLT lessons do not explain the difference between a tree farm and native forest, do not discuss use of herbicides in forest management and do not discuss effects of clear-cutting on ecosystems, or how current timber practices have impacted native animal species. The industry front of PLT remains a concern for many environmental educators.

Since I have personal experience using the PLT curriculum, I must point out a certain critique I have discovered myself. While place-based education is encouraged as a guideline for the lessons, none of them can explicitly achieve this since PLT is a national organization. The lessons they provide must be able to be used in all areas of the country, and therefore cannot address the local concerns in Oregon. In order to effectively use place-based education in EE, the teachers must adapt the concepts and goals of lessons to the local environment in which they are being taught. This requires more individual work and research from the teacher, a step that may not always be taken due to lack of resources, time, or commitment. Regardless of these critiques, the PLT activity guide is still a valuable resource for effective EE and promoting environmental literacy.

Environmental Literacy

Literacy has historically been a term that referred to the ability to read and write. In the past thirty years, advocates for the environment expanded definitions of literacy to include 'environmental literacy' or the ability of an individual to accurately 'read' the environment and make informed choices. In 1990, the United Nations Educational, Scientific, and Cultural Organization (UNESCO) defined environmental literacy as,

> A basic functional education for all people, which provides them with the elementary knowledge, skills, and motives to cope with environmental needs and contribute to sustainable development. [22]

The Oregon Environmental Literacy Plan defines environmental literacy as,

> An individual's understanding, skills and motivation to make responsible decisions that considers his or her relationship to natural systems, communities and future generations.[23]

An environmentally literate student will have the following specific characteristics:

> Treasure outdoor experiences, demonstrate love and respect for nature, participate as active, informed members of their local and global communities, strive to envision features of a sustainable future, understand the dynamics of systems and change, recognize the need for diversity in all systems, become lifelong applied learners, and provide a workforce ready to create a successful and sustainable future.[24]

Environmental literacy also depends on personal commitment to applying skills and knowledge that support environment health, a balanced approach of different perspectives and points of view, and a connection to immediate surroundings.[25] Environmental literacy education has learners investigate, analyze and problem solve through direct experiences with the environment, environmental issues, and society. As the population continues to grow, so does the demand for limited resources; such sustainability challenges require environmentally literate students who can understand and address them.

Becoming environmentally literate is a process. According to Moseley, it begins with nominal environmental literacy, which can grow to functional environmental

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[22] Christine Moseley. "Teaching for Environmental Literacy." (*Clearing House,* 23-25. United Kingdom: Taylor and Francis Group, 2000) 23.
[23] Oregon Environmental Literacy Task Force. *Oregon Environmental Literacy Plan: Toward a Sustainable Future.* (Oregon Department of Education, 2013) 4.
[24] OELP, 13.
[25] OELP, 14.

literacy, and culminate in operational environmental literacy.[26] A nominally environmentally literate person has the ability to recognize and define the basic terms used in environmental communication but has little understanding of them. [27] For example, this person would be able to discuss what forest management is, but is unaware of the causes and effects, why it is happening, or how it works. A functionally environmentally literate person can use fundamental environmental knowledge and thinking to formulate action positions on environmental issues and daily behaviors.[28] For example, this person would be aware and sensitive to the growing need for forest management, understand the effects is has on the forest, its inhabitants, and humans, and grasp how they might be able to participate in this effort. An operationally environmentally literate person has the capacity to perceive environmental issues, gather and evaluate information about them, and take actions that sustain and develop the foundation of environmental knowledge.[29] For example, this person would actively participate in forest management, make sustainable consumer choices regarding timber products, and rally in action groups in support of forest management and protection. People generally follow this progression from awareness, to concern, understanding, and then action as they expand their literacy. Environmental education strives to help citizens become literate by making more people aware of environmental issues, giving them the foundational biological and sociological knowledge about those issues, and then guiding them towards action and problem-solving skills. These key skills

[26] Moseley, 23.
[27] Moseley, 24.
[28] Moseley, 24.
[29] Moseley, 24.

associated with being environmentally literate lead to responsible environmental behavior.

Oregon Environmental Literacy Plan (OELP): Towards a Sustainable Future

State environmental literacy plans were developed in an effort to mediate for a major change in the education system in America: the No Child Left Behind (NCLB) Act that was passed in 2007. This act defined the core content that all students in the United States must learn to be proficient in each grade and focused primarily on math and reading. [30] It is founded on what has come to be known as high-stakes standardized tests. Unfortunately, studies have found that this act greatly reduces the class time spent on social studies and science, as well as outdoor learning activities in order to give more time to tested subjects.[31] Many teachers have received mandates from school districts to eliminate aspects of class that do not directly relate to questions on the standardized tests.[32] Because there is no mention of EE in NCLB, teachers are discouraged from providing valuable field experiences to their students for fear of loss of instructional time on "more important" subjects. Although numerous research studies have found that EE can help students reach these benchmarks and standards in these subjects[33], there is a significant lack of awareness on the part of the role it could play.

One effort currently under way to address this problem is the No Child Left Inside Act (NCLI). The NCLI proposal includes: (1) funding to train teachers on high quality environmental education and how to use the local environment as an extension

[30] "No Child Left Inside." *The Chesapeake Bay Foundation.* (2014. Web)
[31] OELP, 3.
[32] "No Child Left Inside"
[33] Jacobson, 85.

of the classroom; (2) incentives for states to develop State Environmental Literacy Plans to ensure that all students are prepared to understand future environmental challenges; (3) encouragement for schools to make time and resources available for EE; and (4) curricula and training to integrate EE across core subject areas.[34]

The North American Association for Environmental Education (NAAEE) provides guidelines for the creation of each state plan by laying out how a state can deliver high-quality instruction, on a local level, so that students have a basic understanding of their natural surroundings. Each plan, while it will vary from state to state, should ensure that: (1) EE activities are aligned with and support state curriculum content and standards, (2) environmental content is consistent, accurate, and high quality, (3) all communities regardless of resources receive EE in schools, (4) the focus is on both teachers and students, (5) EE is fully integrated into formal education systems, and (6) that non-formal EE providers, community organizations, and natural resource agencies are involved in EE activities in schools.[35] NCLI is also currently working on amending the NCLB to include environmental education for the first time.[36]

As a measure of commitment to protecting the legacy of Oregon, the state passed a legislation (HB 2544) to create an environmental literacy plan that would encourage every student in Oregon to become a lifelong steward of the environment and their community.[37] This house bill set out goals for the plan to reach, and defined the terms of environmental literacy, climate change, and healthy lifestyles. This legislature also identified academic content standards, graduation requirements, how to measure

[34] "No Child Left Inside"
[35] "No Child Left Inside"
[36] OELP, 12.
[37] OELP, 9.

environmental literacy, professional development programs, how to implement and fund the plan, and how to encourage agencies and schools to participate in EE programs.[38] By passing this legislation, Oregon took the first step towards the development and implementation of environmental literacy programs throughout the state of Oregon.

Oregon also passed the No Oregon Child Left Inside (NOCLI) Act in 2009, becoming the first state to pass legislation that directly relates to the development of an environmental literacy plan.[39] Through passing the NOCLI and creating a literacy plan, Oregon is eligible for funding through NCLI. Oregon State University (OSU) Extension is in charge of implementing the state plan for Oregon in partnership with an advisory team of ten to twelve members.[40] They have set goals to advance a state-level comprehensive environmental education program, coordinate with state offices, monitor and report progress, and identify resources and fundraising strategies. Oregon is unique in its commitment to a sustainable relationship with the environment and serves as a model to other states for its expertise in developing green, sustainable communities.[41]

The OELP (or "plan") was originally written in 2010, and then updated again in 2013 by a task force of eleven members from the Oregon Department of Education; Oregon University System; Oregon Departments of Environmental Quality, Fish and Wildlife, State Lands, State Marine Board, Parks and Recreation, Forestry, and Agriculture; The Freshwater Trust; The Environmental Education Association of

[38] OELP, 9.
[39] OELP, 11.
[40] Eric Gray. *New & Notes*. (Portland, Oregon: Grey Family Foundation, February 2014)
[41] OELP, 3.

Oregon; and the Metro Regional Government.[42] They met regularly over the course of 2010 to accomplish specific tasks for developing a plan and consulted various documents to account for diverse interests including the *Excellence in Environmental Education Guidelines for Learning, Climate Literacy: The Essential Principles of Climate Science, Education for Sustainability Standards,* and the Oregon Academic Standards.[43] These resources set a high standard for education in environmental literacy in schools across the Oregon.

The plan is designed to prepare students to understand and address the major environmental challenges facing the state and the country and to help students establish a healthy lifestyle by making outdoor experiences part of school curricula.[44] Preparing the youth to understand their relationship to Oregon's valuable natural resources requires connecting them to the natural environment. Environmental literacy makes this connection by encouraging students to look at the entire system, develop a sense of place, and pursue personal responsibility to the commons and each other. Students who are taught using an environmental framework academically outperform their peers in traditional programs.[45] Also, time spent outdoors for learning is critical to intellectual, emotional and physical health and can improve self-esteem and community involvement.[46]

In order to effectively educate for environmental literacy, the OELP must be integrated into classrooms in Oregon with opportunities for students to participate in

[42] OELP, 4.
[43] OELP, 12.
[44] OELP, 12.
[45] OELP, 4.
[46] OELP, 10.

outdoor learning experiences. The OELP also emphasizes the importance of an interdisciplinary approach to becoming environmentally literate. The task force articulated five strands that provide a comprehensive framework for promoting environmental literacy. To be considered environmentally literate, students must demonstrate proficiency in each of the five areas upon graduation from the twelfth grade. The five strands are summarized in Table 2: [47]

Table 2: OELP Strands

Oregon Environmental Literacy Plan Strands	**Details**
1) **Systems thinking**: Students study systems and issues holistically, striving to understand the relationships and interactions between each system's parts. They use the knowledge gained to assess the effects of human choices on economic, ecological and social systems, and to optimize outcomes for all three systems.	System structure, habits of systems thinking, strategic responsibilities of systems thinking include**:** interdependent parts that change, smaller subsystems, circular feedback loops, short and long-term consequences of actions, understand the big picture, assess outcomes with whole system in mind, mental models, explore systems structure, monitor system outcomes, ask probing questions
2) **Physical, living and human systems**: Students understand the characteristics of Earth's physical, living and human systems.	Structure, function, interaction and change in physical, living and human systems include: changes in matter, evidence for changes over time, climate, indicators of sustainability, organisms, populations, communities, ecosystems, principles of ecology, natural selection, interdependence of plants, animals and the environment, responsibilities of governments, relationships between governments and citizens, public, private and common good, allocation of scarce resources, life cycle analysis of resource use, consumption of goods, ownership of the commons, consumption choices, characteristics of cultures, how individuals relate to others, concepts of responsibility and fairness, how actions affect others and the environment
3) **Interconnectedness of people and the environment:** Students understand the interdependence of humans and the environment, and appreciate the interconnectedness of environmental quality and human well-being.	Sense of place, interrelationships between the environment and human activities, resource distribution and use includes: spatial concepts, natural features, settlement patterns, changes over time, human identity to place, relationships between Earth's major physical and human features, interdependence of renewable and nonrenewable resources, population

[47] OELP, 17-23.

	change, distribution of natural resources, environmental quality and human well being, human ability to shape the environment, national security, climate change, human cooperation and competition for resources
4) **Personal and civic responsibility**: Students understand the rights, roles, responsibilities and actions associated with leading or participating in the creation of healthy environments and sustainable communities.	Rights and responsibilities of citizens, sense of personal responsibility includes: rights of U.S. citizens, personal responsibilities of citizens in a community, civic ideals, the commons, civic dispositions, civic obligations, conflicts between individual rights and societal interests, identify basic personal responsibilities and evaluate their short and long-term effects, fulfilling responsibilities, develop self-confidence in effectiveness as citizens, explain how decisions of one generation affect future generations
5) **Investigate, plan and create a sustainable future:** Students apply civic action skills that are essential to healthy, sustainable environments and communities.	Work with flexibility, creativity openness and perseverance, and demonstrate effective decision-making and citizen action includes: form and evaluate personal views, articulate multiple sides of an issue, consider differing viewpoints, apply global perspectives, evaluate the need for action, identify and evaluate alternative courses of action, propose solutions, speculate probable effects of actions, communicate decisions clearly, plan and take action, envision desired endpoint, set measurements for success, evaluate results, articulate lessons learns, account for any difficulties

Children today are aware of threats to the environment but their physical contact and intimacy with nature is reduced.[48] This lack of time spent in natural surroundings narrows the senses and reduces the richness of human experiences.[49] Creating a more environmentally literate citizenry through various EE programs and organizations has the power to heal the broken bond between humans and nature. Younger generations that are educated to think holistically about the world in which we live understand the dynamic relationships between all living and non-living things. To ensure this education takes place, people from various disciplines must work together to organize strategies to

[48] Pyle, 49.
[49] Louv, 3.

advance environmental learning opportunities like the OELP, and continue to develop environmentally focused curricula like PLT. Henry David Thoraeu said,

> Here is this vast, savage, howling mother of ours, Nature, lying all around, with such beauty, and such affection for her children, as the leopard; and yet we are so early weaned from her breast to society, to that culture which is exclusively an interaction from man on man.[50]

This all begins with the education of our children.

[50] Louv, 5.

The Context for Environmental Education Today

Environmental education is the key to teaching younger generations about their important role in our natural world. EE programs like Project Learning Tree help create strong foundations for understanding the complex physical, living and human systems that students are a part of. In this section, I provide a brief summary of the evolution of EE to present a broad interdisciplinary perspective on the political, social, and economic context of my project and the efforts to implement the OELP. This context also highlights the policies that have served as the underpinnings for nearly all types of EE programs and organizations that exist today, specifically PLT and the OELP. Learning about the context for EE today can help educators understand different tactics for implementing EE and how to incorporate it into their teaching methods.

Perhaps the earliest foundations for EE come from Jean-Jacques Rousseau, a philosopher and writer of the 18th century. He was the first to declare that education should include a focus on the environment and facilitate opportunities for students to learn.[51] Over a century later in 1911, Anna Botsford Comstock published her book *Handbook of Nature Study,* which described the purpose of nature study as the need "to cultivate in children powers of accurate observation and to build up within them understanding."[52] Gradually, a new way of thinking about education changed the way science was taught in schools by emphasizing learning using hands on experiences rather than just books. Around the same time, the progressive education movement, led

[51] Edward J. McCrea. The Roots of Environmental Education: How the Past Supports the Future. (Environmental Education and Training Partnership, 2006) 2.

[52] Anthony Lorsbach and Jerry Jinks. "What 20th Century Nature Study can teach Us." In *The Journal of Natural History Education and Experience,* 7-15. (The Natural History Network, 2013) 9.

by John Dewey, promoted a more student-centered and holistic approach to education. Dewey advocated for an experiential approach to learning in the local environment. He wrote,

> The school may be connected with life so that the experience gained by the child in a familiar commonplace way is carried over and made us of there, and what the child learns in the school is carried back and applied in everyday life, making the school an organic whole, instead of a composite of isolated parts…Experience has its geographical aspect, its artistic and its literary, its scientific and its historical sides. All studies arise from aspects of the one earth and the one life lived upon it.[53]

Dewey thought that a great waste in education was that inability of students to utilize the experiences they get outside of school in any way within the school itself, as well as their inability to apply what they've learned at school in daily life.[54] Creating a connection between the classroom and the world helps students understand and form an active relationship with the one common world we share. Dewey's theories are part of the foundation for experiential learning and place-based education, both critical pedagogical foundations components of EE.

By 1935, the National Education Association took a leadership role for conservation education in school systems throughout the country, which focused on educating students about natural resources and how to conserve them.[55] Studying the environment goes beyond just looking at resources however, and by 1948 it was expanded when the term environmental education was used for the first time professionally by environmentalists from around the world in a meeting of the

[53] John Dewey. *The School and Society.* (Chicago, Illinois: The University of Chicago Press, 1915) 80.
[54] Dewey, 67.
[55] McCrea, 3.

International Union for the Conservation of Nature.[56] By 1953, the number of educators working in the field of EE was large enough that the Conservation Education Association was formed to support them.

National Environmental Education Act of 1970

In 1970, the National Environmental Education Act was passed. This act authorized the creation of an Office of Environmental Education (OEE) in the United States Department of Health, Education and Welfare, established a National Advisory Council for environmental education, and launched a domestic grants program.[57] In addition, the Western Regional Environmental Education Council (WREEC, what is now called the Council for Environmental Education and the same organization that helped create PLT) was created to support environmental education through a partnership and network between education and natural resource professionals.[58] Unfortunately, the Act of 1970 was only funded until 1975 and then repealed in 1981 due to a budget reconciliation bill. It was not until 1990 that Congress revisited the issue of implementing EE.

North American Association for Environmental Education

One of the most important organizations for EE, the National Association for Environmental Education (what is now the North American Association for Environmental Education or NAAEE) was created in 1971 to provide a network for professionals, students, and volunteers working in the field of EE. Their mission is to,

[56] McCrea, 3.
[57] McCrea, 4.
[58] McCrea, 5.

> Combine the perspectives of the environmental and education communities, taking a cooperative, non-confrontational, scientifically balanced approach to promoting life-long learning about environmental issues. [59]

The NAAEE believes that in order to prepare people to work together to solve environmental problems, they must go beyond just raising awareness and learn to think together about decisions regarding environmental stewardship.[60] The Association also stresses the importance of integrating information about environmental issues into all aspects of a curriculum to reach the widest array of audiences. This integration of information is still an important component of developing EE curricula today and can be observed in the PLT activity guide I studied. NAAEE continues to hold annual conferences and distribute a variety of professional products to support EE and its practitioners, which are discussed in more detail in the section on the guidelines to excellence.

Belgrade Charter

Two very significant documents for EE were produced in 1975 and 1977: the Belgrade Charter and the Tbilisi Declaration. In an environmental education workshop in Belgrade, Yugoslavia, UNESCO participants proposed a global framework for environmental education called the Belgrade Charter**.** It is important to understand this charter and the Tbilisi declaration because they are the foundations for the guidelines created by the NAAEE, which were used in the creation of PLT and the OELP. The Belgrade Charter states:

[59] North American Association for Environmental Education. *NAAEE: North American Association for Environmental Education*. (2014. Web)
[60] NAAEE, web.

> The goal of environmental education is to develop a world population that is aware of, and connected about, the environment and its associated problems, and which has the knowledge, skills, attitudes, motivation, and commitment to work individually and collectively toward solutions of current problems and the prevention of new ones.[61]

Tbilisi Declaration

A few years later, The Intergovernmental Conference on Environmental Education in Tbilisi, Republic of Georgia was held on October 14-26, 1977. The Declaration built on the Charter to establish new goals for EE that are still used today. These goals include:

> To foster clear awareness of and concern about economic, social, political, and ecological interdependence in urban and rural areas; to provide every person with opportunities to acquire the knowledge, values, attitudes, commitment, and skills needed to protect and improve the environment; and to create new patterns of behavior of individuals, groups, and society as a whole toward the environment.[62]

UNESCO organized this conference in cooperation with the United Nations Environment Programme (UNEP). In attendance were delegates from 66 member states, representatives and observers from eight U.N. agencies and programs, three other intergovernmental organizations and 20 international nongovernmental organizations. [63] In all, 265 delegates and 65 representatives and observers took part in the conference. Since humans have radically transformed the environment and many of these changes are irreversible and dangerous to the health of virtually all life, it was essential to address these environmental problems globally. The delegates determined that there was a need for more awareness and a better understanding of environmental problems.

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[61] North American Association for Environmental Education. *Environmental Education Materials: Guidelines for Excellence*. (Washington, D.C.: North American Association for Environmental Education, 2004) 1.
[62] NAAEE, 7.
[63] UNESCO, UNEP. "Tbilisi Declaration." Intergovernmental Conference on Environmental Education. (1977) 13.

One solution put forth was environmental education for all ages, in all levels of academia. The Tbilisi Declaration states,

> Environmental education, properly understood, should constitute a comprehensive lifelong education, one responsive to changes in a rapidly changing world. It should prepare the individual for life through an understanding of the major problems of the contemporary world, and the provision of skills and attributes needed to play a productive role towards improving life and protecting the environment with due regard given to ethical values.[64]

Through a holistic, interdisciplinary approach, environmental education can demonstrate that natural environments and the human-made environments are interdependent and have linked consequences. In addition, environmental education must involve the community where individuals are actively engaging in problem solving and feeling a sense of responsibility and commitment to a better future.[65] The Declaration set forth a framework and guidelines for environmental education both inside and outside the formal school system. First, the declaration created criteria for the development of EE programs on a global level. They are (1) emphasize that EE must include discussions of humans and the role they play in anticipating and solving environmental problems, (2) there is an interdependence between economic, political and ecological spheres in the modern world, (3) a sense of responsibility must be developed to account for the dichotomy between socio-economic development and the improvement of the environment, (4) needs to bring a closer link between education and real life so that practical skills can be developed and applied to create solutions to our current environmental problems, and (5) should cater to all ages and socio-professional groups in the population including the general public whose daily lives have an

[64] UNESCO, 13.
[65] UNESCO, 14.

influence on the improvement of the environment, professionals whose activities effect environmental quality, and to scientists and researchers who work to develop the knowledge about the environment that can be used to manage it.[66]

The second part of the framework endorses goals and objectives for guiding EE. In order to reach the goals of the Tbilisi Declaration, it set forth five objectives: awareness, knowledge, attitudes, skills, and participation. In other words, EE programs should: (1) create awareness and sensitivity to the total environment, (2) promote experience in and basic understanding of the environment and its associated problems, (3) offer a set of values and feelings of concern for the environment, (4) foster skills for identifying and solving problems, and (5) provide opportunities to be involved in working towards a resolution of environmental problems.[67]

The final portion of the Tbilisi Declaration discusses twelve guiding principles that environmental education should follow. Each of these principles is equally as important and necessary in carrying out effective EE. They include: (1) thinking about the environment in its totality, (2) examining issues from local, national, regional and international points of view so there is an understanding in other geographical areas, (3) continuing the process of EE throughout an entire lifetime, (4) focusing on current situations while taking into account historical perspectives, (5) promoting the necessity of global cooperation to prevent and solve problems, (6) including environmental aspects in development plans, (7) enabling learners to have a role in the learning experience, (8) emphasizing environmental sensitivity to a local community in early years of EE, (9) discovering the real causes of problems, (10) developing critical

[66] UNESCO, 14.
[67] UNESCO, 15.

thinking and problem solving skills, (11) utilizing diverse learning environments and teaching styles with stress on practical activities and first-hand experiences, and (12) using an interdisciplinary approach to provide a holistic and balanced perspective.[68] When these guidelines are met, EE will be successful.

Thessaloniki Declaration

A follow up declaration was held twenty years after Tbilisi, in 1997. The government of Greece hosted the UNESCO Conference on Environment and Society: Education and Public Awareness For Sustainability where the Thessaloniki Declaration was created. Participants in the conference believed that social change must come before environmental change can occur and that sustainability initiatives must exist at all levels of society in an interdisciplinary nature.[69] The declaration argues that environmental sustainability must be linked with "poverty, population, food security, democracy, human rights, peace and health and a respect for traditional cultural and ecological knowledge."[70] It also affirmed that all subject disciplines in formal education must address issues related to sustainable development and the environment through a holistic approach, and that governments and leaders in education must withhold past commitments made in signing declarations of environmental sustainability.[71]

National Environmental Education Act of 1990

Another significant milestone for EE was the passage of the National Environmental Education Act of 1990. On November 16, President Bush signed the

[68] UNESCO, 16.
[69] Tara Wright. "Definitions and Frameworks for Environmental Sustainability in Higher Education". *Higher Education Policy.* (International Association of Universities, 2002) 7.
[70] Wright, 7.
[71] Wright, 7.

National Environmental Education Act into law. The main goals articulated in the Act were to work with local education institutions, state education agencies, and nonprofit educational and environmental organization to develop curricula, special projects, and other activities to increase understanding of the natural and build environment and to improve awareness of environmental problems.[72] This Act articulated two sectors of environmental education: "formal" education which consists of activities taking place in elementary and secondary schools, colleges and university, and "nonformal" education which includes activities in businesses, nonprofit organizations, and other institutions not part of the education system.[73] According to the Act, in order for EE to be successful it must extend into both of these sectors.

Although the EPA mainly focuses on regulation and enforcement to protect the environment, they have also supported environmental education for many years. With the passing of this Act however, the EPA had Congressional mandate to strengthen and expand EE as part of its mission.[74] Their role in EE is to,

> Provide leadership, facilitate communication as well as information and resource sharing, identify gaps, support the nation's environmental education efforts, and act as an advocate for environmental education nationally and internationally.[75]

The EPA was also directed to establish an Office of Environmental Education to implement programs authorized under the act and coordinate activities with associated federal programs. The EPA established the Environmental Education and Training

[72] Environmental Protection Agency. *National Environmental Education Act*. (Congressional Record, 1990)
[73] NEEAC, 1.
[74] National Environmental Education Advisory Council. *Report Assessing Environmental Education in the United States and the Implementation of the National Environmental Education Act of 1990.* (Washington D.C.: U.S. Environmental Protection Agency Environmental Education Division, December 1996) i.
[75] NEEAC, 19.

Program under the Act to train education professionals to develop and facilitate environmental curricula. The EPA annually awards a higher education institution or nonprofit organization with a grant by reserving 25% of their funding for EE programs to operate this education and training.[76] The National Environmental Education Act of 1990 also established the National Environmental Education Foundation (NEEF) as a complementary organization to the EPA in order to extend the ability to advance environmental knowledge in all areas of the American public.[77] They set up programs and projects to educate, train, and assist professionals in the development and delivery of EE.

Also under this Act, the EPA established the National Environmental Education Advisory Council that is in charge of consulting with the EPA and reporting to Congress on the quality of EE and training.[78] They are responsible for providing general descriptions of the activates conducted pursuant to this Act, summarizing major obstacles to improving EE, and providing recommendations for addressing such obstacles.[79] In their report from 1996, the Advisory Council believed that environmental education was critical and relevant to the daily lives of all Americans. The Council determined that under the Act of 1990, EE has the power to protect human health, advance quality education, expand employment opportunities, promote sustainable development, and protect our natural heritage.[80] The council concluded that the

[76] David M. Bearden. "National Environmental Education Act of 1990: Overview, Implementation, and Issues for Congress." (In *Congressional Research Service*, September, 2008)

[77] McCrea, 7.
[78] Bearden, 6.
[79] Environmental Protection Agency
[80] NEEAC, i.

environmental challenges we face such as climate change, natural resource use, and population growth, require a deeply educated public with the knowledge and skills to participate in solving these problems. The Council drew conclusions about the Act which state,

> There is much more to be done and they [EPA] cannot do it alone. Environmental education must become a priority at the local, state, national, and international level so that—as a nation and as leaders in an increasingly interdependent world—we can make balanced decisions that address the complex social, political, economic, and environmental issues of our time. The members of this Council believe that to ensure a sustainable future we must all work together to make environmental education a priority now.[81]

The National Environmental Education Act of 1990 also outlined the many issues and challenges associated with implementing EE programs across the country. First, environmental education is not a priority across the country due to the focus on standardized testing. It is often seen as an "add-on" and not part of mainstream education. The Act recognizes that programs need to be initiated on state and local levels instead of on a federal level if they are going to be constructed successfully and thoroughly.[82] Another challenge the Act identified is that resources are limited and require various sectors to work together to promote EE. It is common for nonprofit organizations to shoulder the main responsibility for providing funding for EE programs. Passing the National Environmental Education Act gave the EPA funding for an environmental education program; $12 million in 1992 and 1993, $13 million in 1994, and no more than $14 million in 1995, with 25% for the activities of the Office of Environmental Education, 25% for the operation of the environmental education and

[81] NEEAC, 28.
[82] NEEAC, 15.

training program, 38% for environmental education grants, and 10% for support of the National Environmental Education Foundation.[83] Regrettably, appropriated funding expired in 1996.[84] Since then, Congress has been responsible for providing the appropriate resources. In 2008, they passed the No Child Left Inside Act that amended the Education Act of 1990 to authorize a new grant program with a specific focus on achieving academic standards and demonstrating environmental literacy.[85]

Lastly, the Act states that for an EE program to be successful, educators must receive professional development and training. Teachers have expressed their difficulty in running EE programs and feel they are not adequately trained to instruct a lesson with an environmental focus.[86] Universities, colleges, and other training institutions must offer more opportunities for environmental studies, environmental design, environmental engineering, and conservation biology.[87] EE should also be incorporated into the study material of lawyers, businessmen, and planners so they can make environmentally responsible, informed decisions in their fields. Even though a lot has changed since 1990, the Act has not been updated and should be reauthorized to meet to needs for EE today.

NAAEE Guidelines to Excellence

The National Environmental Education Act of 1990 led to more organizations getting involved in environmental education. The NAAEE started their National Project for Excellences in Environmental Education in 1993, which created specific guidelines

[83] Environmental Protection Agency
[84] Bearden, 5.
[85] Bearden, 9.
[86] NEEAC, 15.
[87] NEEAC, 17.

for EE programs and materials. The first publication of their Guidelines to Excellence in 1996, and revised again in 2004 and 2009, consisted of a set of recommendations for developing and selecting EE materials and aimed to help produce high quality products and tools to evaluate the effectiveness of EE.[88] The guidelines, which were used in creating the PLT curriculum, are rooted in the Belgrade Charter and the Tbilisi Declaration and provide educators with tools to develop EE programs that can be integrated across disciplines including science, civics, social studies, mathematics, geography, and language arts.[89]

The guidelines point out six key characteristics of high quality EE materials. First they must be fair and accurate meaning the must be factual, have a balanced presentation of different viewpoints and theories, be open to inquiry, and reflect on diversity.[90] Second, EE materials should provide depth, which means fostering awareness of the natural and build environment, focusing on environmental concepts in context that includes social, economic, and ecological aspects, and being attentive to different scales including local, regional, national, and global levels.[91] Third, the materials should have an emphasis on skill building which means using critical and creative thinking, and applying action skills to resolve issues.[92] The fourth characteristic of excellent EE materials is the inclusion of an action orientation that involves creating a sense of personal stake, responsibility, and self-efficacy.[93] Fifth, EE materials should be instructionally sound, meaning they promote learner-centered instruction, offer

[88] NAAEE, 2.
[89] NAAEE, 2.
[90] NAAEE, 5-6.
[91] NAAEE, 7.
[92] NAAEE, 9-10.
[93] NAAEE, 11-12.

opportunities for different modes of teaching and learning, connect to the learners' everyday lives, expand the learning environment beyond the boundaries of the classroom, are interdisciplinary, clearly spell out goals and objectives, are appropriate for specific learning settings, and have a variety of means for assessing learner progress.[94] Lastly, EE materials should be usable, meaning the overall structure should be clear and logical, easy to use, long-lived, adaptable, accompanied by instruction and support, make substantiated claims, and fit with national, state, or local requirements.[95] Each of these characteristics is broken down into several indicators that suggest how to gauge if the material being used follows the guidelines. It is not expected that all EE materials will follow all of the guidelines, but this allows instructors to recognize weaknesses in materials that should be compensated for in their teaching.[96] The Guidelines to Excellence provide the foundation needed to build an evaluation system for EE that works for different people in different situations.

All of these policies and organizations are important to the advancement of environmental education. They are the foundation for political action taking place today, like the OELP, and the expansion of environmental organizations and curriculum guides, like PLT, that are spreading EE throughout the country. While all of these policies are significant, it is essential that they be regularly updated and revised to keep up with our rapidly changing world.

[94] NAAEE, 14.
[95] NAAEE, 20-21.
[96] NAAEE, 3.

Interdisciplinary EE: A Literature Review

As articulated in Tbilisi, The National Environmental Education Acts of 1970 and 1990, and the NAAEE Guidelines to Excellence, interdisciplinary approaches are critical in EE. Environmental education does not belong strictly to the natural sciences because studying the environment requires the work of everyone, across all disciplines.[97] In order to ensure that the full scope of our natural world is covered, education must evolve to follow the first law of ecology; everything is related to everything else.[98] Connecting different subjects through EE allows students to understand our complex global system and enhances critical thinking, problem solving, and effective decision making skills.[99] An essential underpinning of environmental literacy found in the OELP is integrating and infusing EE across all subjects:

> Disciplines from the natural sciences to the social sciences to the humanities are connected through the medium of the environment and environmental issues. Teaching for environmental literacy offers many opportunities for integration; it works best when infused across the curriculum, instead of being treated as a separate discipline.[100]

To understand how and why the implementation of EE focused on environmental literacy should be interdisciplinary, I discuss the ways that Language Arts shifts our perspectives about the environment, especially by studying literature. I also explore the significance of creating connections through experiences (place-based education) and the importance of active student involvement in the learning process.

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[97] Merrilyne Lundahl. "Teaching Where We Are: Place-Based Language Arts." In *English Journal* (Illinois: National Council of Teachers of English, 2011) 44.
[98] Lauren G. McClanahan. "The Greening of Language Arts: Considering Sustainability Outside of the Science Classroom." In *Journal of Sustainability Education Vol. 4*, edited by Larry Frolich. (Journal of Sustainability Education, 2013) 9.
[99] American Forest Foundation, 3.
[100] OELP, 14.

Language Arts and English in EE

Today, we have pushed our world to capacity and have created dangers such as over-consumption, overpopulation, and most importantly, climate change. Cheryll Glotfelty, the first professor of Literature and the Environment in America, explains,

> We have reached the age of environmental limits, a time when the consequences of human actions are damaging the planet's basic life support systems… Either we change our ways or we face global catastrophe, destroying much beauty and exterminating countless fellow species in our headlong race to apocalypse…as environmental problems compound, work as usual seems unconscionably frivolous. If we're not part of the solution, we're part of the problem.[101]

Environmental problems are largely of our own making and a by-product of our culture. Unfortunately, these impacts and relationships with the natural world are not commonly studied in language arts classes.[102] These literature classes in the 20th and 21st centuries predominately focus on topics such as race, gender, class and culture. From classics to fiction, the settings in literature serve merely as a backdrop for context instead of something more important.[103] Students are learning about how their ethics impact their own lives, but are failing to recognize their impacts on the natural world and the relationship they have with it. The goal now is to shift this perspective to make nature the narrative,[104] something that can be done through interdisciplinary EE.

The subject of English itself requires integrated studies of race, gender, class, sex and language to fully understand humanity. In order for English to truly be full, it

[101] Cheryll Glotfelty and Harold Fromm. *The Ecocriticism Reader: Landmarks in Literary Ecology.* (Athens, Georgia: University of Georgia Press, 1996) xx.
[102] Heather E. Bruce. "Green(ing) English: Voices Howling in the Wilderness?" In *English Journal,* 12-26. (Illinois: National Council of Teachers of English, 2011) 13.
[103] McClanahan, 2.
[104] Bruce, 18.

must be linked to our planet and our geophysical world.[105] English teachers strive to enhance students understanding of life and realize the importance of universal human concerns that are linked to environmental issues, like availability of food, water, shelter, and good health, through literature.[106] They work to teach students different cultural values and develop acceptance and respect for others through reading and writing activities. These teachers look for literature that will keep students emotionally alive and morally sensitive in the face of our modern technological society.[107] These teachers also specialize in the ability to raise questions of vision, values, ethical understanding, meaning, tradition, and culture.[108] These qualities of Language Arts are all crucial keys to the environmental crisis today and it is important to integrate them with environmental education efforts.[109]

Language Arts can be directly used to develop environmental literacy, since Language Arts requires advanced skills of noticing, responding, listening, paying attention, observing, communicating, understanding how things relate to each other, creating habits of looking closely, thinking critically, and theorizing, which are all the essence of environmental literacy.[110] Students who study literature and composition will be encouraged to think seriously about the relationship between humans and nature, the ethical dilemmas that accompany this relationship, and how language and literature can

[105] Bruce, 12.
[106] Bruce, 14.
[107] Bruce, 12.
[108] McClanahan, 3.
[109] Bruce, 15.
[110] Bruce, 15.

transmit values that have ecological implications.[111] Becoming aware of and thinking about these relationships is the first part of building environmental literacy.

Another component of Language Arts that can shift our perspectives on the environment is "reading green". This involves focusing on environments in literary expressions and examining literature through an eco-critical lens.[112] Students can read authors like Henry David Thoreau, Mahatma Gandhi, Aldo Leopold, Rachael Carson, Sherman Alexie, and Leslie Marmon Silko, to understand the complex interactions between humans and the natural world. When students read green, they analyze how the characters in the literature interact with the environment and how the setting causes these characters to act in particular ways.[113] Reading with an ecological-centered perspective instead of a human-centered one gives students the opportunity to understand how everything is connected and to think beyond themselves to rebuild their relationships with the planet. "Literature can help us think about how we relate to places, other people, and other species… showing us who we are and challenging us to imagine who we might be".[114] Reading green, or focusing on environments in literary expression, helps students explore their relationship with the environment and shapes how we respond to environmental realities as a culture.

Place-Based, Experiential Learning in EE

In addition to studying literature and "reading green", EE can be more effective when students create valuable experiences and connections to the environment through

[111] Glotfelty, xxv.
[112] Bruce, 16.
[113] Bruce, 16.
[114] Bruce, 16.

place-based education. David Orr taught the importance of developing a sense of place through direct contact with nature in order to reach ecological literacy. To integrate his theories into educational practices, Orr suggests six principles to apply: (1) all education is environmental education, (2) environmental issues are complex and cannot be understood through a single discipline or department, (3) for inhabitants, education occurs in part as a dialogue with a place and has the characteristics of good conversation, (4) the way education occurs is as important as its content, (5) experience in the natural world is both an essential part of understanding the environment, and conductive to good thinking, and (6) education relevant to the challenge of building a sustainable society will enhance the learner's competence with natural systems.[115]

According to Basile and White, three important components of EE are context, connections, and communication.[116] They argue that the context must be about the environment itself and encourage children to create experiences that are meaningful and relevant; this requires active learning to promote inquiry and collaboration that applies to the real world.[117] Teachers should take on the responsibility of modeling environmental stewardship by showing enthusiasm for the natural world and for learning, which can be contagious to children.[118] Leading children to ask descriptive, interpretive, and speculative questions may uncover features of a place, where

[115] David Orr. Ecological Literacy: Education and the Transition to a Post-Modern World. (New York: State University of New York Press, 1992) 15.
[116]Carol Basile and Cameron White. "Respect Living Things: Environmental Literacy for Young Children." In *Early Childhood Education Journal* (New York: Human Sciences Press, 2000) 57.
[117] Basile and White, 58.
[118] Basile and White, 58.

something came from, what processes it participates in, what can it teach us, how it speaks to the human world, and what universal truths it embodies or represents.[119]

Spending time in nature, even for a short period of time, develops habits of the mind that are necessary to being critical, creative and engaged as both a student and a citizen. Studies have shown that the keys for growing up with a conservationist attitude are many hours spent outdoors during childhood and an adult who taught respect for nature.[120] Local places outdoors can be used as sites for linking students to the environment in which they live, developing personalized understandings of biodiversity, and encouraging unique and authentic personal experiences in the community.[121] These experiences guide students towards empathy, understanding the purpose of studying the environment, and salvaging what we have left in nature.[122] Lundahl argues that if students are given the opportunity to read and create place-based descriptive writings, metaphors, reflections on experiences, journals, and research, they are more likely to create a connection to that place.[123] Children can then build from what they have learned, what they know, and their experiences and connections to create their own fundamental understanding of the natural world.

The OELP also highlights the importance of where you live as an essential underpinning of environmental literacy. The Plan states that exploring close to home allows learners to forge connections with and understand their immediate surroundings. The skills and knowledge needed for this local connection "provide a base for moving

[119] Lundahl, 48.
[120] David Sobel. *Beyond Ecophobia: Reclaiming the Heart in Nature Education*. (Great Barrington, MA: Orion Society, 1996), Louv, and Plye.
[121] McClanahan, 8.
[122] McClanahan, 8.
[123] Lundahl, 45.

out into larger systems, investigating broader issues, and expanding understanding of causes, connections and consequences".[124]

Student Voices in EE

Another important component of EE is making sure the students play an active role in the learning process. Education is meant to give students the power to perceive the way they exist in the world.[125] Communication on a two-way street allows students to be actively involved in the learning process through means of voicing their experiences and opinions.[126] The OELP lists active participation as another essential underpinning of environmental literacy; the learner's interests should guide instruction.[127]

For EE to be successful, teaching *at* students must evolve to facilitating an inclusive learning environment. The best learning takes place when students are engaged in the process. A term for this type of teaching is engaged pedagogy. Coined by bell hooks, it is a progressive, holistic type of education that emphasizes well-being and self-actualization of both teacher and student.[128] It values student expression, freedom, and sharing information about their lives and cultures. In addition to the students, a classroom that employs engaged pedagogy "will also be a classroom where teachers grow, and are empowered by the process."[129] Students and teachers must take

[124] OELP, 14.
[125] Paulo Freire. *Pedagogy of the Oppressed.* (New York: Continuum Books, 1993), 83.
[126] Basile and White, 58.
[127] OELP, 14.
[128] bell hooks. *Teaching to Transgress: Education as the Practice of Freedom.* (New York: Routledge, 1994) 15.
[129] hooks, 21.

the same risks in sharing narratives of their experiences in order to link them to and enhance academic discussions.

Teachers have the responsibility of making each student voice noticeable, not turning them all into one. Encouraging individual student voices may eventually lead to those students speaking and taking action for the environment, not just watching.[130] To do this, students should be encouraged to write and reflect from their experiences, specifically place-based, so they have more authentic reasons to promote environmental stewardship. They feel powerful when they have the knowledge, skills and values to investigate the environment and learn on their own.[131] By being actively involved in the "doing" of learning, children become empowered in their abilities and strengths. An open, democratic, investigative learning environment places emphasis on the process of exploration and discovery instead of just the results.[132]

[130] McClanahan, 7.
[131] Basile and White, 58.
[132] Basile and White, 61.

Results

After cross-walking the forty-six Language Arts focused PLT lessons with the five strands of the OELP, I found that nearly all of the lessons articulated concepts and objectives of at least one or more of the strands. Table 3 lists the number of lessons that reached each of the five strands. Only seven did not articulate any of the five strands. Below, I provide detailed explanations as to how the lessons incorporate the respective strands.

Table 3: Number of Lessons for each OELP strand

OELP Strand	**Number of PLT lessons addressing strand**
1. Systems Thinking	25
2. Physical, living, and human systems	24
3. Interconnectedness of humans and the environment	18
4. Personal and civic responsibility	13
5. Investigate, plan and create a sustainable future	10

Table 4 provides a complete summary of the results and Table 5 shows the five lessons that articulated all five strands.

Table 4: PLT lessons cross-walked with the OELP strands

PLT Lesson	1. Systems thinking	2. Physical, living, human systems	3. Interconnectedness	4. Responsibility	5. Future
1. The Shape of Things					
2. Get in Touch with Trees					
4. Sounds Around	X		X	X	X
5. Poet Tree			X		
7. Habitat Pen Pals		X			
8. The Forest of S.T. Shrew	X	X			
9. Planet Diversity	X	X	X		
11. Can It Be Real?		X			
13. We All Need Trees	X	X	X		

16. Pass the Plants, Please			X		
17. People and the Forest	X	X	X		
18. Tale of the Sun					
20. Environmental Exchange Box		X			
21. Adopt a Tree	X	X			
26. Dynamic Duos	X	X			
35. Loving it Too Much	X	X	X	X	X
40. Then and Now			X		
41. How Plants Grow	X	X			
42. Sunlight and Shades of Green	X	X			
44. Water Wonders	X	X			
45. Web of Life	X	X			
46. Schoolyard Safari		X			
49. Tropical Treehouse	X	X	X		
51. Make Your Own Paper					
54. I'd Like to Visit a Place Where…	X	X	X	X	X
55. Planning the Ideal Community	X				
56. We Can Work It Out				X	
58. There Ought to Be a Law	X			X	X
59. Power of Print					
60. Publicize It!				X	X
61. The Closer You Look					
62. To Be a Tree					
71. Watch on Wetlands	X	X	X	X	X
72. Air We Breathe	X		X	X	X
76. Tree Cookies		X			
77. Trees in Trouble	X	X			
78. Signs of Fall					
79. Tree Lifecycles	X	X			
80. Nothing Succeeds like Succession	X	X			
84. The Global Climate	X	X	X	X	X
86. Our Changing World	X	X	X	X	X
87. Earth Manners			X	X	X
89. Trees for Many Reasons	X		X	X	
91. In the Good Old Days					
92. A Look at Lifestyles	X		X	X	
93. Paper Civilizations					
95. Did You Notice?			X		

Table 5: PLT lessons that articulated all 5 OELP strands

PLT Lesson	1. Systems thinking	2. Physical, living, human systems	3. Interconnectedness	4. Responsibility	5. Future
35. Loving it Too Much	X	X	X	X	X
54. I'd Like to Visit a Place Where…	X	X	X	X	X
71. Watch on Wetlands	X	X	X	X	X
84. The Global Climate	X	X	X	X	X
86. Our Changing World	X	X	X	X	X

Strand One: Systems Thinking

Strand One of the OELP articulates the need for students to study systems and issues holistically, in order to understand the relationships and interactions between system parts. They also must think about the effects of human choices on economic, ecological and social systems to optimize outcomes for all three. Teachers interested in incorporating systems thinking into their classroom lessons might consider the following twenty-five lessons. Below I provide a short description of the activities, with particular attention to the elements that link it to this OELP strand. The subcategories of each strand, and details within these subcategories, are underlined. It may be useful to reference the detailed descriptions of each strand found in Table 2 above.

#4 Sounds Around (pg. 26-30)

In this lesson, "students tune in to the sounds in their environment and identify and lesson local noise problems."[133] Students use systems thinking to understand the relationship between sounds, noises, and the Earth's living and human systems. By creating sound maps, students consider the issue of noise levels and seek to understand the big picture by recording plant, animal, people, and machine sounds. They also consider long and short-term consequences of actions that increase sounds and the unintended consequences they bring with them. Students begin to learn how human action or inaction affects the system in which we live.

[133] American Forest Foundation, 26.

#8 The Forest of S.T Shrew (pg. 40-44)

This lesson focuses on the dynamic systems of micro-habitats and the biodiversity that occurs within them because of the interaction of living and nonliving environmental components, such as plants, fungi, animals, rocks, soil, nutrients, and humans. By reading the story, students learn about the subsystems that exist within larger habitats like forests and the interdependent relationship between these systems and their parts.

#9 Planet Diversity (pg. 45-49)

In this lesson, students pretend they are visitors from outer space and describe all of the life they find in a small plot of land to become more aware of the diversity and abundance of life on Earth.[134] Students investigate the dynamic living and human systems that exist on Earth and explore how their interdependent parts change over time, generating new patterns and trends. They learn about the relationships between diversity among biological communities and humans. Students question and test assumptions about biodiversity and seek new perspectives by using an outside, 'alien' perspective. In order to understand Earth's living systems, students consider the big picture by first starting small, and then compiling information as a group to form conclusions about biodiversity. After they have considered all the data, students make conclusions about how human action may affect the system and consider their consequences.

[134] American Forest Foundation, 45.

#13 We All Need Trees (pg. 65-68)

In this lesson, students learn how much we depend on trees in our daily lives. Students study all the different and complex part of a tree and how humans derive products from nearly all of those parts.[135] Students learn how changing outcomes requires changing structure; for example, in order to produce products from the wood of the tree, such as lumber for building, furniture, particle board, and plywood, the structure of the tree must be heavily altered. Students ask questions about where products come from and test assumptions by thinking about all the things that come from trees and whether they've used anything that day from trees. They determine if their mental models effect how they realistically think about our dependence on trees. Students are encouraged to think about the big picture by learning about all the different parts of a tree and how humans use those parts to create material goods. Students determine that human action has a large effect on trees and that there are many intentional and unintentional consequences of these actions.

#17 People and the Forest (pg. 82-85)

In this lesson, "students learn about some of the ways people have depended on forests throughout history."[136] Students read about the Mbuti forest people to help them understand the dynamic relationship between the forest dwellers and the forest and how their actions affect the outcomes of the living system. Students conduct research to discover the cause-and-effect relationship of the forest dwellers lifestyles on the forests. They also consider short and long term consequences of action that have taken place in

[135] American Forest Foundation, 65.
[136] American Forest Foundation, 82.

our society in the last 40 years and their effects on the culture of the forest people. Students seek new perspectives to increase their understanding of human dependence on forests and notice how elements of the forest system have changed over time, generating new patterns and trends.

#21 Adopt a Tree (pg. 97-101)

In this lesson, students observe and investigate information about trees and use their observations to identify relationships between their tree and other organisms. Students use all of their senses to compare how trees are different, similar, whether or not they are alive, what they offer for students, and how they help the environment in which they live. These observations help students notice how system elements change over time and understand how a systems structure generates its behavior.

#26 Dynamic Duos (pg. 113-116)

In this lesson, students learn about different types of symbiotic relationships between organisms. Students discover the different parts that make up an ecosystem and how they are all dependent on one another. The relationships between these parts determine the outcomes and behaviors of the entire system. Students learn about mutualistic and symbiotic relationships and how they are like circular feedback loops; for example, a bird drinks the nectar from a flower→ pollinates the flower→this pollination attracts more birds and insects to use the flower for food. Students also discover how there are many short- and long-term consequences of actions that result from these symbiotic relationships, which cause system changes over time. This lesson

stresses the importance that students understand the big picture of ecosystems and recognize how fragile they are.

#35 Loving it Too Much (pg. 147-152)

In this lesson, students look at problems in America's National Parks and "begin "grappling with some tough environmental issues that affect parks locally and globally."[137] For the first strand, systems thinking, this lesson is successful at exploring how dynamic systems, like national and local parks, consist of interdependent parts, such as trees, animals, insects, people, climate, etc., that change over time and produce outcomes. Students explore how park visitors and activities both inside and outside the park boundaries affect ecosystems within the parks. Population increases have caused more visitors at the parks. This requires more services to be built like roads, parking lots, lodging, restrooms, and visitor centers. This circular feedback loop, increase in population→crowded cities→more people to parks→more services→increase in population due to accessibility, has detrimental effects on the parks. Students also explore the short- and long-term effects of more people visiting by considering how elements within and around the park change over time based on this increase in population.

#41 How Plants Grow (pg. 179-181)

In this lesson students "design experiments to explore what happens when a plant's basic needs are unmet."[138] In order to understand the effect that their experiments will have on the plants, students must study the structure of a plant and the

[137] American Forest Foundation, 147.
[138] American Forest Foundation, 179.

physical systems that act upon it. They must understand the relationships and interactions between all of the plants parts and its life supporting processes like photosynthesis, the transport of water, and pH of the soil. Students consider the short- and long-term effects of actions on the plants survival. This lesson also requires students to envision, design, plan, act, and assess outcomes with whole system in mind as they conduct their experiments. Students monitor system outcomes based on their experiments compared to the control plan and make adjustments along the way. They are then required to ask probing questions when things don't work to discover different environmental conditions that effect plant growth.

#42 Sunlight and Shades of Green (pg. 182-184)

In this lesson, students are introduced to photosynthesis and test what happens when they block sunlight from leaves of a tree.[139] Photosynthesis is a dynamic system that involves: sunlight, air, water, nutrients, and the plant. Students learn about the relationships between these parts and the dependence they have on one another. Students look at the circular feedback loops of photosynthesis; roots absorb water and minerals→water and minerals contact with chlorophyll and air→ sunlight hits the chlorophyll and gives it energy to break water molecules→ hydrogen and carbon dioxide mix to create carbohydrates as food. This cycle repeats itself continuously throughout a plants life. To get a greater understanding on how photosynthesis works, students question and test assumptions by covering up leaves on a tree and monitor the outcomes through observation. After their observations, students ask probing questions about what happened and why photosynthesis was not able to work as planned.

[139] American Forest Foundation, 182.

#44 Water Wonders (pg. 188-193)

In this lesson, "students are introduced to various steps of the water cycle and make connections between the water cycle and all living things."[140] Students explore the dynamic parts of the water cycle system: precipitation, evaporation, transpiration, glaciers, icebergs, runoff, groundwater, aquifers, lakes, oceans, and soil. Each of these parts is essential to the whole system and changing any of them will alter the behaviors and outcomes of the entire water cycle. Students describe the path that a water molecule might take as it travels through the water cycle and seek to understand the big picture. This lesson also has students consider how human action or inaction effects the water cycle and think about the intentional and unintentional consequences of those actions.

#45 Web of Life (pg. 194-196)

This lesson guides students to observe how ecosystems are made up of interdependent organisms and other components. It talks about the forest as a complex living system, made up of smaller systems of plants and animals. They are all connected through the energy from food.[141] Students are introduced to concepts of photosynthesis, food chains and food webs. Each student collects information about an organism that live in the forest and researches where it lives, what is eats, what feeds on it, how it depends on other organisms, and how it influences the environment in order to understand the systems structure and seek new perspectives. Once the research is complete, students pass a ball of string around to each other to illustrate the connections that exist between all of the organisms. Students gain an understanding about the

[140] American Forest Foundation, 188.
[141] American Forest Foundation, 194.

importance of each organism, what would happen if it were removed from the ecosystem and identify where unintended consequences may emerge.

#49 Tropical Treehouse (pg. 207-216)

In this lesson, "students explore the rainforest by researching rainforest inhabitants, mapping the route of neotropical migratory birds, and analyzing a case study involving a tropical rainforest."[142] The tropical rainforest is a complex structure that consists of interdependent parts that change over time and produce outcomes. Students must use habits of systems thinking to understand the dynamic relationships that exist within rainforests. Students also recognize the cause-and-effect relationships of parts within rainforests and consider short- and long-term consequences of different actions to understand the big picture.

#54 I'd Like to Visit a Place Where… (pg. 236-238)

In this lesson, "students develop an understanding of the value of recreational areas and facilities and why these areas are established locally and nationally."[143] They also learn about the community's system for managing open spaces. In order to understand the importance of recreational areas, they start by listing all the different things found in a park and the relationships that exist between them. Students must think about the complex structure of recreational areas by considering all the things that influence them: people, wildlife, waterways, history of the area, and laws. Changing any of these parts can affect the entire park as a whole. Students recognize the importance of protecting these recreational by seeking new perspectives to increase

[142] American Forest Foundation, 207.
[143] American Forest Foundation, 236.

their understanding and consider the potential issues fully. Lastly, students consider how human action or inaction effects the system by looking at what kinds of recreational activities take place in that area, what plants and animals live there, how many people visit the park each year, and how they could help protect the area.

#58 There Ought to Be a Law (pg. 249-251)

In this lesson, "students examine why and how groups develop rules, find out how local laws are made, and create a poster presentation on the process for passing a low they propose."[144] In order to understand how to propose and pass a law, students learn about the structure of the legal system and the function and relationship of each of its interdependent parts. They seek to understand the systems structure in order to identify possible leverage actions and deepen their understanding of how to plan actions and achieve goals.

#71 Watch on Wetlands (pg. 303-307)

In this lesson, students "conduct field studies in a local wetland to learn how land use decisions and legislation affect wetland areas."[145] Because this lesson focuses on wetland ecosystems, system thinking is essential for student success. Wetlands are very diverse and consist of complex systems made up of smaller subsystems. Students explore the relationships between these systems by gathering information about how these parts work together to produce certain behaviors. Students question and test assumptions by taking photos, mapping the area from different vantage points, surveying the variety of plant and species they observe, and testing the quality of the

[144] American Forest Foundation, 249.
[145] American Forest Foundation, 303.

water in the wetland. They are encouraged to understand the big picture of a wetland and how all of the parts work together to create desired outcomes and behaviors.

#72 Air We Breathe (pg. 308-313)

In this lesson, students "learn about indoor air quality and what they can do about it."[146] Students study the dynamic system of our atmosphere and the subsystems of particles that effect air quality. They are encouraged to think holistically to understand the relationship between the parts of Earth's physical system and their importance to humans. Students conduct experiments to explore how human action affects the system in which we live and determine if these actions are worth the risks. This lesson aims to teach students to understand the big picture of air quality by looking for unintended consequences that emerge, specifically for indoor air pollution.

#77 Trees in Trouble (pg. 332-336)

In this lesson, students explore how living trees become sick, weak, unhealthy and injured based on certain environmental conditions.[147] Students are guided to start thinking about how natural processes in ecosystems sometimes damage organisms. Students gain an understanding of Earth's complex living system by conducting experiments to alter certain parts of the system. They envision, design, plan, act and assess outcomes with the whole system in mind in order to consider the intentional and unintentional short- and long-term consequences of actions. When it comes time for students to read the fables about trees, they will understand that while humans have a

[146] American Forest Foundation, 308.
[147] American Forest Foundation, 332.

significant impact on trees and have the power to change the natural system, other factors influence the health and survival of trees as well.

#79 Tree Lifecycles (pg. 341-344)

In this lesson, students "discover that trees have a lifecycle that is similar to that of other living things and investigate a tree's role in the ecosystem at each stage of its life."[148] Students study the progression of a tree from a seed, to sprout, to sapling, to maturity, to death, to rotting log and recognize each part of this progression as a circular feedback loop. Students conduct research to analyze each stage of a tree's life while taking into consideration events that may take place throughout the trees life that effect its growth, like fire damage and identify where unintended consequences may emerge. Students discover how the elements like climate, nutrients, sunlight, water, competition, humans, and other trees change over time, which generate different patterns throughout the tree's life.

#80 Nothing Succeeds Like Succession (pg. 345-349).

In this lesson, students "read a story about succession, and investigate the connection between plants, animals, and successional stages in a local ecosystem."[149] This lesson requires students to use systems thinking to fully understand the disturbances that create changes in the structural development and composition of plant communities. Students must consider all of the parts within an ecosystem to understand how and why succession takes place. Through reading a story and recording the different stages of succession, students learn about how everything in an ecosystem is

[148] American Forest Foundation, 341.
[149] American Forest Foundation, 345.

connected and how one change can affect the whole system. Through exploring these relationships, students gain an understanding for how species diversity and ecosystem changes are directly related. They also consider short- and long-term consequences of these changes and seek to understand the big picture.

#84 The Global Climate (pg. 363-369)

In this lesson, students "graph changes in atmospheric levels of carbon dioxide over a 46-year period, and identify possible reasons for those changes."[150] Because this lesson is centered around studying the Earth's climate system, students must you systems thinking to fully understand the how complex it is. To study Earth's climate, students must look to what happens in the atmosphere, oceans, cryosphere, geosphere, and biosphere and how they interact with each other to produce outcomes. Students are encouraged to apply the strategies of systems thinking to consider possible actions that can be taken to reduce the amount of carbon dioxide generated.

#86 Our Changing World (pg. 375-377)

In this lesson students make graphic organizers to connect natural resources, energy, and human activities. They also research a global issue to gain an understanding of some of the issues facing us today as a global society.[151] Students are required to use systems thinking to understand the relationships and interactions between the dynamic parts of our ecosystem. Students must explore how the flow of energy and cycling of nutrients connect the plants and animals and how they are linked to the Earth's biogeochemical cycles. Students learn that effecting any one of Earth's systems will

[150] American Forest Foundation, 363.
[151] American Forest Foundation, 375.

impact the system as a whole. They make lists of natural and human generated parts of Earth' systems and create diagrams to explain how they are connected. They also monitor the outcomes of the ecosystem to consider intentional and unintentional short- and long-term consequences of actions in order to determine if the rewards are worth the risk.

#89 Trees for Many Reasons (pg. 387-388)

In this lesson, students "read stories to examine the importance of conserving natural resources."[152] By reading fables about natural resource use, students gain a greater understanding of the relationships and interactions between Earth's systems. They study how the relationship between humans and natural resources determines the outcomes and behaviors of our ecosystem. Students also recognize the nature of complex cause-and-effect relationships when they read about the Once-ler in *The Lorax* and Elzeard in *The Man Who Planted Trees.* These stories encourage students to consider issues fully, by looking at short- and long-term consequences of actions and indentifying where unintended consequences emerge. Encouraging students to look at the big picture through stories can help explain to them how humans affect the systems in which we live and help them think about whether the rewards of actions are worth the risks.

[152] American Forest Foundation, 387.

#92 A Look at Lifestyles (pg. 401-406)

In this lesson, students "reflect on their own lifestyles and identify trade-offs between simple subsistence and the modern technology-based living."[153] Students explore the complexity of Earth's living and physical systems and their relationship to human systems. This lesson encourages students to recognize the circular nature of complex cause-and-effect relationships by looking at how humans have altered the environment over the years. They also notice how system elements change over time, generating new patterns and trends, and how these changes are often linked to human action. Students must study the issue of natural resource use holistically in order to understand the effects of human choices on economic, ecological and social systems.

Strand Two: Physical, living, human systems

Strand two of the OELP articulates the need for students to understand the characteristics of Earth's physical, living, and human systems, and to examine their structure, function, interactions and changes.[154] Teachers interested in incorporating physical, living, and human systems into their classroom lessons might consider the following twenty-three lessons. Below I provide a short description of the activities, with particular attention to the elements that link it to this OELP strand. The subcategories of each strand, and details within these subcategories, are underlined. It may be useful to reference the detailed descriptions of each strand found in Table 2 above.

[153] American Forest Foundation, 401.
[154] OELP, 17.

#7 Habitat Pen Pals (pg. 37-39)

This lesson is successful at exploring Earth's physical and living systems. Students will gain a greater understanding of biodiversity, the interactions of living and non-living environmental components, and how organisms adapt to changes in their environment. It teaches students to identify similarities and differences between organisms and the connection between organisms and the environment they live in.

#8 The Forest of S.T. Shrew (pg. 40-44)

This lesson focuses on the dynamic systems of micro-habitats and the biodiversity that occurs within them because of the interaction of living and nonliving environmental components. By reading the story, students learn about the subsystems that exist within larger habitats like forests and the interdependent relationship they have with one another. This lesson also explores structure and function of organisms and the importance of biodiversity.

#9 Planet Diversity (pg. 45-49)

In this lesson, students analyze a plot of land for its variety of life forms and draw conclusions about diversity. Students look for evidence of changes over time, how climate effects diversity, the structure and function of the organisms and mini-ecosystem in their plot. Their main focus is to present detailed information about the biodiversity on Earth. They make conclusions about the interdependence of plants, animals and the environment by studying how areas with a greater variety of plants tend to have a greater variety of animals. Once they have considered all of the data, students try to draw conclusions about the effects of individual and group action on the

environment and how human systems (political, economic, and social) can affect the abundance or lack of biodiversity on Earth.

#11 Can It Be Real? (pg. 54-58)

This lesson teaches students about amazing plants and animals and the adaptations that they gain to survive in a particular environment. Students consider the geologic, climatic and environmental changes that have occurred over time and the effect that they have on species diversity. In order to learn about extraordinary plants and animals, students explore the unique adaptations that these creatures have gained over time to help it survive in a particular environment.[155] These adaptations are linked to the climate, carry capacity, population dynamics, heredity, natural selection and the influence of the interdependence of plants, animals and the environment on survival. Students thoroughly study the concepts of evolution and natural selection to determine what adaptations animals have made and why.

#13 We All Need Trees (pg. 65-68)

In this lesson, students learn how much we depend on trees in our daily lives. In order to understand how often trees are used to make material goods, students must explore the structure, function, interactions and changes that take place in the process from living tree to product. Students recognize indicators of sustainability when considering how much of a tree goes into making a product. They also look at the detailed structure of trees, including wood, bark, cellulose, sap and fruits/seeds. This lesson discusses the importance of trees to our economic system by having students

[155] American Forest Foundation, 54.

make lists about all of the products from trees we depend on. Students conduct a life cycle analysis of trees as a resource by looking at production, distribution, consumption and disposal of products from trees and the effects of each of these processes. Finally, students discuss consumption and consumer choice regarding products made from trees.

#17 People and the Forest (pg. 82-85)

In this lesson, students learn about some of the ways people have depended on forests throughout history. By reading about different forest dwelling people around the world, students understand the characteristics of Earth's living and human systems. They conduct research to find evidence of changes that have occurred in the forests and the cultures of its people over time. Students learn about the structure and function of forest ecosystems as well as their biodiversity, carry capacity, and population dynamics. They discuss the interdependence of plants, animals and the environment and consider how human systems affect this relationship. Exploring the lifestyles of other cultures encourages students to analyze the relationship between governments and citizens, especially those who native to the forests. Concepts of public, private and common good are briefly discussed when students pose questions about how the forests cultures have changed over time because of outside influences. Most importantly, students explore the characteristics of diverse cultures and how they influence concepts of responsibility, fairness and equity, resource use, and sustainability. Students also talk about the effect of group actions on the environment and the shared and conflicting societal values and principles regarding forests.

#20 Environmental Exchange Box (pg. 92-94)

In this lesson, students "prepare an environmental exchange box to learn more about heir own region and the things that are special about it."[156] In order to create a thorough box, students must study the structure, function, interactions, and changes in the physical and living systems of their area. To do so, students take pictures of local ecosystems like forests, marshes, and beaches, create drawings of local plants and animals, record videos of animal sounds, collect samples of natural objects like leaves, nuts, cones, flowers and rocks, describe regional cultural events, and describe local environmental issues.[157] They consider how climate effects the environment in which they live and what factors make their local area different from another region. Students are encouraged to think about differences in biodiversity, carry capacity, population dynamics, species change, sustainability, roles and impacts of local government on ecosystems, allocation of resources, history of their area, how different people understand the commons, and the affects of individuals and groups on the health of an ecosystem.

#21 Adopt a Tree (pg. 97-101)

In this lesson, students observe and investigate information about trees and use their observations to identify relationships between their tree and other organisms and to understand the interdependence of plants, animals and the environment. Students use all of their senses to study biodiversity and the structure and function of trees and their ecosystems to compare how trees are different, similar, whether or not they are alive,

[156] American Forest Foundation, 92.
[157] American Forest Foundation, 93.

what they offer for students, and how they help the environment in which they live. Students keep a journal about the changes they observe that their tree goes through over time and any indicators of sustainability.

#26 Dynamic Duos (pg. 113-116)

Through studying different types of symbiotic relationships between organisms, students gain an understanding of the structure, function, interactions and changes in living systems. They discover the matter and energy flow in and between organisms and their dependence on one another. Students study the biodiversity within ecosystems and the interdependence of plants, animals and the environment essential for survival.

#35 Loving it Too Much (pg. 147-152)

This lesson explores the evidence of changes over time and the structure and function of organisms, populations, communities and ecosystems in and around the parks. The carrying capacity of the parks as population grows is highlighted as a huge concern because it can lead to ecosystem changes that could upset the natural balance.[158] This lesson makes sure to emphasize the interdependence of plants, animals and the environment and the threat that human may impose on this relationship. When discussing national parks, it is essential to mention the responsibilities of governments for protecting public, private and common good and differentiating between public and private ownership of the commons.

[158] American Forest Foundation, 147.

#41 How Plants Grow (pg. 179-181)

In this lesson, students study the characteristics of plants and what they need to survive. By studying the biological system of a plant, students learn about matter and energy flow within a plant, how they obtain energy and materials for growth, and how climate greatly affects these processes. They also consider how ecosystem change can affect a plants ability to grow by conducting experiments on light, water and soil conditions.

#42 Sunlight and Shades of Green (pg. 182-184)

Students study photosynthesis to understand the process that trees and plants use to create their own food. They learn about the structure and function of plants including their roots, leaves, and stem and how each of those parts plays an important role in the process of photosynthesis. Students learn about the matter and energy flow in plants by studying how plants obtain energy and materials for growth. They also consider the interdependence of plants, animals and the environment, and how small changes can affect the entire system.

#44 Water Wonders (pg. 188-193)

In order to fully understand the entire system of the water cycle, students study the structure and composition of the atmosphere, geosphere, and hydrosphere. This lesson teaches them about the journey a water molecule takes and how it cycles through a variety of different systems on Earth.[159] Students recognize the effects different climates have on the water cycle, specifically the influence of oceans on the weather.

[159] American Forest Foundation, 188.

They also study the structure and function of the water cycle on land by conducting an experiment about how plants affect the flow of water and prevent erosion. Lastly, students consider how human systems have the ability to influence the water cycle by creating dams, covering reservoirs, making snow, etc.

#45 Web of Life (pg. 194-196)

This lesson guides students to observe how ecosystems are made up of interdependent organisms and other components. It talks about the forest as a complex living system, made up of smaller systems of plants and animals. They are all connected through matter and energy flow or biochemical cycling.. Each student collects information about an organism that live in the forest and researches where it lives, what is eats, what feeds on it, how it depends on other organisms, and how it influences the environment. This information helps students understand the interdependence of plants, animals, and the environment. Once the research is complete, students pass a ball of string around to each other to illustrate the connections that exist between all of the organisms and recognize indicators of sustainability. They gain an understanding about the importance of each organism and what would happen if it were removed from the fragile ecosystem.

#46 Schoolyard Safari (pg. 197-199)

In this lesson, students study the dynamic living system that exists in their schoolyard. By going on a safari, students discover the biodiversity of plants and animals that call thee schoolyard their habitat. Students are encouraged to make observations about everything they see in the schoolyard to draw conclusions about

population dynamics, ecosystem changes, carry capacity, and the interdependence of plants, animals and the environment.

#49 Tropical Treehouse (pg. 207-216)

By creating an image of a cross-section of a rainforest, students consider different structures, functions, and interactions of physical and living systems. They learn about the different organisms and ecosystems within the layers of a rainforest and vast array of biodiversity that is sustained in specific environments. Students recognize the changes and cycling of matter between systems components in the rainforests, such as the emergent, canopy, understory and forest floor. It is important for students to observe changes that occur over time in rainforests, specifically the climate, biodiversity, population dynamics, and natural resource use. Students also discuss human systems in relation to tropical rainforests by reading about public laws regulating land and natural resource in forests. They are asked to consider questions about the relationship between governments and citizens, including tribal communities, the impact of government functions on societies, concepts of public, private and common good, and how people with different cultural backgrounds interpret experiences and places.

#54 I'd Like to Visit a Place Where… (pg. 236-238)

This lesson successfully discusses the structure and function of ecosystems, importance of biodiversity, population dynamics within recreational areas, and the interdependence of plants, animals and the environment. Students explore how protecting existing recreational areas and creating new ones enhances the ecosystem as

a whole because it benefits more than just humans, but also animals, plants, water, and air. Students explore the social and cultural importance of parks and how humans form personal connections to these recreational areas.

#71 Watch on Wetlands (pg. 303-307)

The physical, living and human systems of wetlands are explored thoroughly as students take a trip to their adopted wetland and survey the structure, function, interaction and composition of that ecosystem. Students explore the relationships within the wetland ecosystem by gathering information about how these parts work together to produce certain behaviors. Students study the populations of plant and animal species they observe, observe habitat sources and sinks, ecosystems change, species change, and ecological indicators of sustainability. These observations allow students to understand the interdependence of plants, animals and the environment.

#76 Tree Cookies (pg. 327-331)

This lesson has students examine cross-sections of trees to infer what environmental conditions might have occurred in its life.[160] In order to fully understand the big picture of a tree's life, students must look for evidence of changes over time that may have affected the tree's growth and health. Students account for changes in the ecosystem that may have affected the tree, as well as the influence of climate, carry capacity of a region, and population dynamics. Students discuss the interdependence of plants, animals and the environment and how this influences survival. Finally, students

[160] American Forest Foundation, 327.

consider how different people understand the commons and maintain its health when they research events that took place in a tree's lifetime.

#79 Tree Lifecycles (pg. 341-344)

This lesson calls for students to understand the structure, function, interaction and changes in living systems, like trees. By looking at the lifecycle of a tree, students begin to understand the cycling of matter between components of an ecosystem at different stages in a trees life. Students consider the effects that climate, biodiversity, carry capacity, ecosystem changes, evolution, and human action have on the lifecycle of a tree. Students look for indicators of sustainability in forests by conducting research about particular trees and their population's success within the forest. They also focus on the interdependence of plants, animals and the environment and how one event that effects a tree, like fire damage, is likely to clear the way for another event, like birds nesting in a hole.

#80 Nothing Succeeds Like Succession (pg. 345-349)

In this lesson, students "investigate the connection between plants, animals, and successional stages in a local ecosystem."[161] Studying succession helps students learn about the changes in matter that occur in ecosystems, the cycling of energy between components within the system, and the effects that climate has on the rate of change. Students look for evidence of geologic, climatic and environmental changes over time that effect what type of succession takes place. They also consider how biodiversity, habitat sources and sinks, and natural selection influence this process as well. Studying

[161] American Forest Foundation, 345.

succession also leads students to acknowledge the interdependence of plants, animals and the environment and the health of all three.

#84 The Global Climate (pg. 363-369)

In order to understand how the Earth's climate functions, students are required to study the characteristics of Earth's physical, living and human systems. In this lesson, students discover what the greenhouse effect is and the different greenhouse gases that exist in the atmosphere. Students graph that changes in atmospheric CO2 concentrations over 46 years and observe patterns of change.[162] Students also learn about the relationship between higher CO2 levels and changes in the atmospheric conditions and the effects this has on air temperature and living systems. Higher temperatures can disrupt weather patterns, cause coastal flooding, increase disease-causing organisms, alter natural habitats, and cause some plants an animals to go extinct.[163] In order to fully understand the effects of global climate change, students also study how these changes impact human systems. Students specifically look at the political action that has been taken around the world as the threat of global warming increases, ways our economic systems have contributed to this issue, how industrialized countries differ in natural resource consumption from those who that are less developed, global societal changes and actions effect GHG concentrations in the atmosphere.

#86 Our Changing World (pg. 375-377)

In order to study patterns of change that take place in the Earth's systems, students explore the structure, function, and interactions between physical, living and

[162] American Forest Foundation, 363.
[163] American Forest Foundation, 364.

human systems. They must look for evidence for geological, climatic and environmental changes over time and study the processes that drive and regulate climate variability. Students must explore how the flow of energy and cycling of nutrients connect the plants and animals and how they are linked to the Earth's biogeochemical cycles. Students learn that effecting any one of Earth's systems will impact the system as a whole. They make lists of natural and human generated parts of Earth' systems and create diagrams to explain how they are connected. Students focus on the impact of humans on Earth's living systems by researching a global change issue. They must discover what actions contribute to this issue, the impact and responsibilities of citizens and governments, how different people understand the commons and the measure needed to maintain its health.

Strand Three: Interconnectedness of people and the environment

Strand three of the OELP articulates the need for students to study the interdependence of humans and the environment, and understand the interconnectedness environmental quality and human well-being.[164] Teachers interested in incorporating the interconnectedness of humans and the environment into their classroom lessons might consider the following seventeen lessons. Below I provide a short description of the activities, with particular attention to the elements that link it to this OELP strand. The subcategories of each strand, and details within these subcategories, are underlined. It may be useful to reference the detailed descriptions of each strand found in Table 2 above.

[164] OELP, 19.

#4 Sounds Around (pg. 26-30)

This lesson guides students towards thinking about the interconnectedness of people and the environment in multiple ways. Sound mapping helps students develop a sense of place by analyzing spatial concepts, natural features, and changes that occur over time. They explore the physical and human characteristics of places by differentiating between natural and man-made sounds. Students are able to learn about human settlement patterns and land use by determining where there are higher concentrations of noise pollution. This lesson calls for students to record the different human activities that change Earth's systems by listening for traffic, construction, and other loud noises. Students also determine human ability to shape and control the environment when they discuss how a community can improve noise control by creating buffers.

#5 Poet Tree (pg. 31-33)

In this lesson, students understand the interdependence of humans and the environment by studying trees in their local environment and the benefits that these trees have for humans. Students study the natural features of a local park or forest in order to observe the relationships between earth's major physical and human features. They write poems to reflect on their experience in the forest or park and ask questions such as does the poem mention the influence people have on trees, does it mention the value of trees to people, and does the poem speak of people's place in nature?[165] These questions help students reflect on the different types of human activities that can change earth's living systems and evaluate our human ability to shape the environment.

[165] American Forest Foundation, 32.

#9 Planet Diversity (pg. 45-49)

Studying a small plot of land encourages students to form a sense of place by learning about spatial concepts and natural features, like flora, fauna, climate, and soils. As they discuss their findings with classmates, students observe the continuity and changes in their plots over time and how knowledge of one region can be applied to study others. Students study how diversity among species provides humans with a variety of food, wood, fibers, energy, raw material, chemicals and medicines and that changes in the environment effect our systems. Students also study how human settlements expansion worldwide has change earth's systems by causing an increase in the rate of species extinction. By comparing the diversity on Earth to that on planet Deevoid, students begin to understand the interrelationship between environmental quality and human health and well-being.

#13 We All Need Trees (pg. 65-68)

This lesson has students explore the interconnectedness of people and the environment by studying the many different products humans get from frees. Students explore the natural features of trees to examine all of their different parts and how we transform those to create product for ourselves. Students are asked to think about all of the things they use that come from trees to explore human resource use and how human activities and systems change earth's systems, such as forests. Students also begin to understand human dependence on natural resources for a high quality of life and how environmental changes can affect our economic systems.

#16 Pass the Plants, Please (pg. 77-81)

In this lesson, students begin to understand just how much plants affect our daily lives. By examining different types of foods, such as tortilla chips, bread, pizza, in addition to fruits and vegetables, students learn about the variety of foods that come directly from plants.[166] Students also study the interrelationship between environmental quality and human health by looking at their local food systems and food security. Students begin to discover the human ability to shape and control to the environment, specifically our agricultural/farming system.

#17 People and the Forest (pg. 82-85)

Students explore a sense of place and region by learning about natural features of forests. They are introduced to the settlement patterns of forest dwellers and how they relate to Earth's physical and living systems. The main focus of this lesson is to explore the cultural heritage of a forest region, why they are important to human identity, and how they have changed over time. Through research, students understand how conflicts involving land use and resource competition can cause. For the forest dwellers, environmental changes like scarcity of food and loss of land and vegetation, effect human systems and the ability to maintain a good quality of life. In addition, students learn how human activities, like the construction of roads, hunting, and clear cutting forests, change Earth's systems. Students are guided to make connections between environmental quality and human health and well-being by discussing how cultures and lifestyles have changed as a result of changes in our natural world.

[166] American Forest Foundation, 77.

Specifically in the reading on the Pesch in Honduras, students begin to explore conflicts over territory and the effects they have on different cultures.

#35 Loving it Too Much (pg. 147-152)

This lesson is successful at having students think about their sense of place and the natural features like flora and fauna that exist in their local and national parks. National parks have become a part of our cultural identity and are an important symbol of our society. Students are required to explore the effects that humans have had on parks and the ability humans have to shape the natural environment.

#40 Then and Now (pg. 174-176)

In this lesson, students understand how people effect and alter the environment in which we live.[167] Students analyze the characteristics of their community and region including spatial concepts, natural features, settlement patterns, continuity and changes over time, and the human characteristics of the region in which they live. Students also look at how the human and physical aspects of place, such as buildings, housing developments, schools and parks relate human identity. By comparing the changes that have happened over time in their community, students learn how human activities can change earth's systems, as well as our ability to shape and control the environment. Students conduct interviews with people in their community to further explore the human dependence on the environment, especially natural resources, for high quality life.

[167] American Forest Foundation, 174.

#49 Tropical Treehouse (pg. 207-216)

Students are guided to think about how the physical aspects of places and regions relate to human identity, specifically the American Samoa in the tropical rainforest, the roles that self-interest, different points of view, and the global distribution of natural resources play in territorial conflicts, and conflicts involved with land use, economics, resource competition, political views, boundary disputes, and cultural differences within the geographic area of the national park. Students learn about the effects human activities can have on Earth's living systems, like large-scale clearing for agriculture and forest products. They also understand how human activities like these can severely effect habitats, which upsets the ecological balance of the rainforest, in turn effecting people around the world.

#54 I'd Like to Visit a Place Where…(pg. 236-238)

This lesson successfully discusses the interconnectedness of people and the environment by encouraging students to think about their connection to a recreational area and describe the characteristics of that place. Students think about spatial concepts, natural features, character of the community, human characteristics of a place, and why recreational areas are so important to human identity. Students also explore how humans have the ability to alter the environment and the effects that those alterations have on recreation areas and other parts of the ecosystem.

#71 Watch on Wetlands (pg. 303-307)

The interconnectedness of people and the environment becomes apparent in this lesson when students analyze the characteristics of a local wetland. They explore the

natural features, including flora, fauna, climate, and geological features and the continuity and changes that have occurred in the place over time. Students also learn about the effect humans have on the environment when they discuss a scenario regarding building an office on a property that was once a wetland. Students continue to explore the effect humans can have on the local environment when they read about the Pala Lagoon case study and determine if a home should be built at the expense of cutting down mangrove trees and filling the wetland with soil. They discuss the potential detrimental effects human action could have on the water quality of the lagoon, the rare trees, shrubs, and threatened species on the island.

#84 The Global Climate (pg. 363-369)

Students study the interconnectedness of human systems and the global community, specifically the interdependence of renewable and nonrenewable resource use at the local, national, and global scale, and the relationship between Earth's major physical and human features. Students study and analyze how environmental changes effect human systems and how our human systems, like agriculture, transportation, and manufacturing change the environment. Students are encouraged to explore the connection between environmental quality and human well-being, and determine the impact that increased CO2 in the atmosphere would have on societies. In this lesson, students also explore human dependence on natural resources for high quality life and how that resource use impacts our Earth's physical and living systems.

#86 Our Changing World (pg. 375-377)

Students gain an awareness of the interconnectedness of people and the environment through multiple parts of this lesson. By drawing diagrams of natural and human built parts of the Earth's system, students get a visual of the relationships between Earth's major physical and human features and understand how human activities and systems change Earth's physical and living systems. Students also learn about the interconnectedness of people and the environment when they play a game with yarn. During the game, students toss a ball of yarn around to each other to show how something is connected to the item before it. The student must explain the connection before tossing the ball of yarn to another student, until all the students are connected. [168] They then discuss how human actions that directly effect part of the Earth's systems also indirectly effect many other parts.

#87 Earth Manners (pg. 378-381)

Students discuss why places are important to human identity and the interrelationships between humans and the environment. Students learn that their actions can change Earth's physical and living systems. In reading the story "Trapper", students make connections between the quality of the environment and human health and well-being. Because it's easy for humans to shape and control the environment, students consider how to have the smallest impact on Earth's systems. They also discuss the idea that while one thing taken from a habitat may not be missed, if everyone in the

[168] American Forest Foundation, 375.

class took one thing, it could make a big difference[169], further emphasizing how human cooperation and competition for resources can shape the environment.

#89 Trees for Many Reasons (pg. 387-388)

After reading two stories and listing the major ideas within them, students consider the continuity and changes of place over time as a result of human action or inaction. *The Lorax* teaches students that both environmental changes effect human systems and human systems change the environment; the Once-ler is dependent on the availability of trees to make his Thneeds and the trees determine the number of products he makes, but as his company grows, so do the devastating effects to the animals, habitats, and water and air quality. As the environmental quality of the area decreased, so did the number of humans who wanted to be there. The other story, *The Man Who Planted Trees*, teaches students about how one man was able to restore a desolate area of land and turn it back into wilderness, filled with growing trees and flowing streams. This story encourages students to think about the difference one person can make in the environment and the connection between environmental quality and human well-being. Students are guided to understand that while humans are dependent on natural resources, their cooperation and competition for these resources can have a significant impact on the environment.

#92 A Look at Lifestyles (pg. 401-406)

This lessons calls for students to determine items that come from natural resources that they use in their lives. They create lists to establish what items are

[169] American Forest Foundation, 379.

essential to their survival, maintain their current lifestyles, and are simply luxuries.[170] By recognizing that each of the items on their lists comes from a natural resource, students begin to understand how human systems change the environment. They also observe how environmental quality and human well-being are connected because when you have access to a healthy environment, you have more access to the goods and services it provides. Students spend part of the lesson exploring how human cooperation and competition for resources shape our environment when they discuss how the settlement patterns of pioneers. Students describe how humans have always depended on natural resources for life, from when we first pioneered the forests to the products and goods we require today. Human settlement is also linked to natural resources because the pioneers were attracted to land covered with forests, wildlife, plants, and that little competition for these resources. Students ask and answer questions about how the pioneers used the land and resources compared to American Indians, their attitude toward natural resources, their impact on the environment, and what factors contribute to environmental changes.

#95 Did You Notice? (pg. 414-417)

In this lesson, students "study changes in their local environment over short and long periods and identify patterns of change."[171] Students gather information about the history of their community to gain a greater understanding of sense of place, the cultural and economic heritage of the place where they live, and the changes in environmental quality over time. By creating a timeline about changes over the years in their

[170] American Forest Foundation, 401.
[171] American Forest Foundation, 414.

community, students explore what cause these changes, whether or not they were beneficial or harmful, look for trends, and think about implications for the future. This timeline helps show students how human systems change the environment and how environmental quality and human well-being are interconnected.

Strand Four: Personal and civic responsibility

Strand four of the OELP articulates the need for students to study the rights, roles, responsibilities and actions linked to participating in the creation of healthy environments and sustainable communities.[172] Teachers interested in incorporating responsibilities into their classroom lessons might consider the following twelve lessons. Below I provide a short description of the activities, with particular attention to the elements that link it to this OELP strand. The subcategories of each strand, and details within these subcategories, are underlined. It may be useful to reference the detailed descriptions of each strand found in Table 2 above.

#4 Sounds Around (pg. 26-30)

After students explore the differences between sounds and noises, and record the noise level in different locations outside, they discuss how noise can be a problem for the community. They describe personal responsibilities of citizens in reducing the amount of noise pollution in their community and analyze civic ideals like equality and respect that impact how people treat the commons. Students evaluate how conflicts may arise in areas where noise pollution is high and propose how they can take personal responsibility to effectively reduce the noise level. Students are able to develop self-

[172] OELP, 20.

confidence as a citizen by contacting local authorities and citizen groups to learn how individual and group action and public opinion can create beneficial change and promote the common good.

#35 Loving it Too Much (pg. 147-152)

Students explore the rights and responsibilities of citizens to protect local and National Parks by discussing different problems taking place and potential solutions. This lesson encourages students to create their own views on peoples' responsibility to the commons and how societal interests can conflict with personal ones. Students learn that they have the power as citizens to make changes that will effect generations in the future.

#54 I'd Like to Visit a Place Where…(pg. 236-238)

Students are asked to think of ways they could personally help or improve a local park or recreation area. They explore both civic responsibilities and personal responsibilities to improve the park for people and other organisms. They work individually and collectively to explore problems or improvements that the class could help address in a park and explain how these actions can effect future generations.

#56 We Can work It Out (pg. 241-243)

In this lesson, students learn about the process for planning and resolving conflicts, specifically environmental ones in their community. Students explore the rights and responsibilities of citizens in their community by looking at civic ideals like rule of law, equality, civic participation, and respectful deliberation, and civic dispositions like trust, honesty, patience, and open mindedness. Students also evaluate

how conflicts arise between individual rights and societal interests when students simulate the legislative model for decision-making in a community. This simulation also helps students develop self-confidence in their effectiveness as a citizen by teaching them the power of the public opinion. Students work individually and collectively to resolve issues, like the Heritage Oak dilemma.

#58 There Ought to Be a Law (pg. 249-251)

This lesson explores the rights and responsibilities of citizens, and their importance in making choices locally. In order to understand how and why laws are created, students analyze civic ideals and explain important civic dispositions. They also evaluate how conflicts arise between individual rights and societal interests and why rules are important and necessary. Students will discuss the notion of responsibility, both for themselves and commonly accepted societal views, and evaluate the importance of fulfilling responsibilities for themselves, society, the commons, people in other places, and other living beings. Students brainstorms laws that would make their community better and address current environmental concerns and develop confidence in their effectiveness as a citizen through understanding how they can create beneficial change, promote common good, influence environmental policy, and create opportunities for future generations.

#60 Publicize It! (pg. 256-260)

In this lesson, students discover the rights and responsibilities of citizens in making decisions when they conduct service-learning projects and use the media to inform others in their community about it. By exploring environmental issues and

proposing solutions for them, students gain a sense of personal responsibility for the environment and self-confidence in effectiveness as a citizen to solve environmental problems in their community. Students also work individually and collectively to resolve these issues and participate thoughtfully and respectfully in decision making.

#71 Watch on Wetlands (pg. 303-307)

By participating in a public hearing regarding building a home on a lagoon, students learn about the rights and responsibilities of citizens. They explore different civic roles, including families, villages, environmentalists, and government officials. They compare and contrast views on individual responsibility to the commons and evaluate how conflicts arise between individual rights and societal interests. They learn to explain how the decisions of one generation can create opportunities for or impose constraints on future ones.

#72 Air We Breathe (pg. 308-313)

Students begin to explore the roles, responsibilities, and actions associated with creating a healthy environment. They compare and contrast views on individual responsibility to the commons by talking about different sources of air pollutants and their associated risks. Looking at these pollutants also stimulates students to consider whether civic obligations require individuals to subordinate their desires to the public good. Indoor air pollution can be difficult to regulate because conflicts often arise between individual rights, like smoking tobacco and heating our homes, and societal interests, like high air quality and a reduction of pollution. Students consider their personal responsibility to keeping the air clean by suggesting ideas on how to remedy

problems in their home, like restricting indoor smoking, changing filters, cultivating house plants, etc. Creating these lists helps students analyze the effect they and the groups they belong to can have on the environment. They also teach students how individual and group action can create beneficial change, meet individual needs, and promote the common good.

#84 The Global Climate (pg. 363-369)

In this lesson, students learn that things they do every day like dive a car, heat a home, and use electricity, burn fossil fuels that emit CO2 and other greenhouse gases.[173] They compare and contrast different views on responsibilities towards the commons and how conflicts can arise between individual rights and societal interests such as a healthy environment or sustainable community. Students also bring in their family's electric bill to calculate the amount of CO2 their family and the class, two groups they belong to, generate in a month. This activity guides students to think about their basic personal responsibility towards global climate change and compare their view of their own responsibilities with commonly accepted societal views. This activity also has students evaluate the importance of fulfilling responsibilities for themselves, society, the commons, people in other places, and other living beings. They learn how individual and group action can create beneficial change and promote the common good, how citizen action has effected environmental quality, and ways in which their own actions can make a difference.

[173] American Forest Foundation, 363.

#86 Our Changing World (pg. 375-377)

By picking a global change issue to investigate, students learn personal and civic responsibilities associated with creating a healthy environment and sustainable community. Students prepare presentations of these issues and discuss how individuals and societies can make positive changes with regard to this global issue. They form personal views about global environmental issues and attempt to think creatively to make previously unrecognized connections. During their research, students explore different perspectives on the issue and whether or not certain areas or people would be equally affected by this global change.

#87 Earth Manners (pg. 378-381)

This lesson has students set guidelines for exploring and enjoying nature, so that they have respect for living things and their habitats. Students name rules and guidelines for learning outdoors and establish personal responsibilities for the environment. They deeply explore the importance of making responsible decisions for the environment by creating Earth manners they wish to follow. Students compare and contrast views on individual responsibilities to the commons and evaluate the importance of fulfilling these responsibilities for themselves, society, people in other places, and other living beings. They also explain how carrying out Earth manners and being responsible in the environment can create positive opportunities for future generation.

#89 Trees for Many Reasons (pg. 387-388)

Both of the stories that students read in this lesson discuss personal and civic responsibilities. Students discuss personal responsibilities of citizens in a community,

analyze civic ideals including freedom and equality, and compare and contrast view on individual responsibilities to the commons. Looking at how the Once-ler treated the environment versus how the Lorax treated it, students can evaluate how conflicts arise between individual rights and societal interests. Dr. Seuss's message about how one person can save or destroy the environment encourages students to think about their own basic responsibilities and the effects they have on the environment and community sustainability. They can evaluate the importance of fulfilling responsibilities for themselves, society, the commons, people in other places, and other living beings. The story about the man who planted trees shows students how individual action can create beneficial change, promote the common good, and create opportunities for, or impose constraints on, future generations.

#92 A Look at Lifestyles

Students compare and contrast views on individual responsibility to the commons and analyze civic ideals like freedom, equality, civic participation, and respect. They are encouraged to think about their own personal responsibility when they discuss the items they require for their lifestyles. Because all of these items come from natural resources, students analyze the effects they have on environmental and community responsibility and evaluate the importance of being responsible with our natural resources for the sake of themselves, society, the commons, people in other places, and other living beings. Students develop confidence in their effectiveness as a citizen as they consider how individual and group action and decisions, like the settlement of the pioneers or the choice to use nonrenewable resources, can affect environmental quality and impose constraints on future generations. This lesson

encourages students to think of ways to more effectively judge how our actions effect the environment today.

Strand Five: Investigate, plan and create a sustainable future

Strand five of the OELP articulates the need for students to apply civic action skills that are essential to healthy and sustainable environments and communities.[174] Teachers interested in incorporating action for the future into their classroom lessons might consider the following ten lessons. Below I provide a short description of the activities, with particular attention to the elements that link it to this OELP strand. The subcategories of each strand, and details within these subcategories, are underlined. It may be useful to reference the detailed descriptions of each strand found in Table 2 above.

#4 Sounds Around (pg. 26-30)

This lesson guides students to form and evaluate personal views by discussing what sounds they liked and didn't like. They consider differing viewpoints about sounds by engaging in informed and respectful deliberation about what qualifies as noise pollution and work with people who may have different perspectives from them. Students think creatively to make connections by reading about the Story of Marsyas and express the ideas and emotions within the story. After recording sound levels in different sites on different days, students evaluate the need for action to reduce noise pollution and identify options for citizen action, such as contacting foresters, state

[174] OELP, 21.

officials, and fellow citizen groups. They speculate probably effects of specific actions, like building a sound buffer, and the likelihood of resolving the problem of noise pollution. This lesson guides students to envision an end point of at least 50% noise reduction and to develop a plan to diminish the noise level of a heavily traveled highway to that of a suburban street on a quiet evening.

#35 Loving it Too Much (pg. 147-152)

Students discuss problems facing the Park Service, potential solutions to these problems, and discuss their own personal views with those of their peers. They are encouraged to articulate multiple sides of the issue, collaborate with people who have different perspectives from them, and identify interests that underlie people's positions and behaviors. Students are also guided to identify key individuals and groups effected by the issue of increased populations of people in the parks and evaluate alternative courses of action to help these effected parties. This lesson calls on students to identify as many different options for citizen action, speculate probable effects of these actions, envision a desired end point and articulate the pros and cons of each recommendation.

#54 I'd Like to Visit a Place Where…(pg. 236-238)

Students are asked to decide what type of project they want to take on to improve a local park or recreation area. They identify different strategies that can be used to address challenges and create desired futures and then evaluate the effectiveness of these solutions. After the project is completed, students are asked to reflect on their experience by discussing how they felt working gin the park, how their actions help other people and organisms, and why it is important for people to do this work.

#58 There Ought to Be a Law (pg. 249-251)

This lessons calls for students to divide into teams and decide on a possible law they would like to see put into action. By conducting research, gathering and organizing relevant data, and answering questions, students articulate multiple sides of an issue, evaluate personal beliefs and values, consider differing viewpoints, identify key individuals and groups effected, and speculate on the probable effects of specific actions and the likelihood that they will resolve the problem. Students then create presentations summarizing the information they have gathered and the plan they propose. The presentations analyze the long and short-term consequences of action, the intended or unintended effects of action on themselves, others and the environment, and the success of their desired law.

#60 Publicize It! (pg. 256-260)

To carry out their service learning projects, students first form and evaluate personal views about environmental issues and engage in deliberation about these issues in their community. They work productively in teams to think creatively and arrive at new ways of thinking about local issues. Students also think about the accuracy and reliability of information in the media and consider the best possible way to tell the most people about their project. When they create their projects, students identify and analyze different strategies in order to address their challenges and demonstrate effective decision making. They speculate the probable effects of their proposed actions and the likelihood that they will resolve the problem.

#71 Watch on Wetlands (pg. 303-307)

By adopting a wetland and investigating its dynamic components, students document problems that might exist and create a plan on how to improve the situation. They are encouraged to contact the owners or managers of the area to discuss potential action that can be taken. If given permission, students can analyze options for citizen action and then create a plan for action like a clean up of the site or take on more complicated projects with the help of those who manage the area. Once complete, they evaluate the effectiveness of their action and whether or not they reached desired outcomes.

#72 Air We Breathe (pg. 308-313)

Once students have explored the multiple sides of indoor air pollution and have formed their own personal views, they collaborate to propose actions that are likely to be effective in raising air quality. Students will envision a desired endpoint (reduction in indoor air pollution), articulate reasons and goals for action, and develop a plan on how to improve the air quality in their homes. They are then given a set period of time to implement these improvements and report back to discuss any changes or difficulties they faced.

#84 The Global Climate (pg. 363-369)

After forming their own personal mental models about the world, students are encouraged to apply a global perspective to the issue of climate change and articulate multiple sides of the issue to address these diverse perspectives. They also use the concept of cumulative effects to explain why specific changes and human actions

cannot be considered in isolation from other; climate change is a global issue and requires students to make connections on that scale. In this lesson, students conduct statistical analyses to evaluate the changes in CO2 concentrations and evaluate the need for action. Based on evidence, students are encouraged to think of ways they take action like reducing the amount of energy they use and how other citizen actions, like consumer and resource use choices, can be effective in generating positive outcomes. Lastly, students discover energy-saving actions that they can take on their own and the benefits those actions have on reaching a desired endpoint. Students share these actions with their families and set measurements for analyzing their short and long-term success.

#86 Our Changing World (pg. 375-377)

In this lesson, students investigate different global change issues such as energy shortages, ozone depletion, ocean pollution, deforestation, population growth, etc.[175] Students form personal views about these global issues and choose one to thoroughly research. They investigate different perspectives on the issue to identify courses of action and propose solutions that are likely to be effective in fixing the issue. They engage in deliberation on global issues and take opportunities to express their ideas and emotions. Students gather and organize relevant data about their issue, use logical and reasoning skills to evaluate the reliability of information, and consult various unbiased sources to define and clarify the dimensions of the issue. In their research, students identify key individuals and groups affected by the issue and explain the various perspectives these people have. They examine contextual elements that shape the issues

[175] American Forest Foundation, 375.

and identify any historical antecedents related to it. They also analyze the characteristic, causes and consequences of the issue and decide if action to solve the issue is warranted.

#87 Earth Manners (pg. 378-381)

In this lesson, students form and evaluate personal views about the environment and engage in deliberation on how people should respect it. They cooperate to generate a list of guidelines they believe will solve problems people create by not respecting living things and their habitats. Students investigate different perspectives on Earth manners and identify alternative courses of action. They evaluate the need for Earth manners and create a cohesive plan on how to carry out their proposed manners.

Patterns Observed

The PLT guide is used across ten different grade levels and I found that many of the lessons for younger grades did not articulate as many of the OELP strands as the lessons for older grades did. I attribute this pattern to the fact that some of the strands, personal and civic responsibility, and investigate, plan and create a sustainable future, require higher-level thinking that can be difficult to teach in lower grade levels (PreK-5th grade). Lessons aimed at higher grade levels (specifically 6th-8th grade) however, including #35 Loving it Too Much, #58 There Ought to be a Law, #71 Watch on Wetlands, #83 The Global Climate, and #86 Our Changing World, did convey the concepts and practices of the strands that require this higher-level thinking. This pattern may be a result of teaching objectives for early adolescences described by Sobel. He

presents three stages of development that should be of concern to educators: early childhood ages four to seven, elementary years ages eight to eleven, and early adolescences ages twelve to fifteen. Each of these stages should have a different style of environmental education: early childhood activities should center on empathy with the natural world, middle childhood activities should center on exploration, and early adolescence should center on social action.[176] Strands four and five focus on social action, which should therefore be taught in grades 6-8.

Another important pattern to note has to do with strand two, physical, living and human systems. There were some lessons that articulated the strand thoroughly, but a variety of them had a stronger focus on physical and living systems, over human ones. This pattern may be attributed to the fact that PLT's main objective is to develop awareness of and appreciation for the natural world. Over half of the 100 lessons in the entire activity guide take students outdoors to connect with the physical and living systems of nature.[177] Once students understand these systems, they are more inclined to explore human systems by understanding their local place, explore what is happening in their communities, and become inspired to be responsible, productive, and participatory members of society.[178]

Because I reference the importance of place-based education, and PLT includes it as one of its curriculum criteria, I must acknowledge the Language Arts lessons that stray from a local focus. Lesson #17 People of the Forest discusses the Mbuti forest people from the Democratic Republic of Congo and the Pesch Indians of La Mosquitia,

[176] Sobel.
[177] American Forest Foundation, 5.
[178] Jacobson, 66.

Honodorus. Part of lesson #49 Tropical Treehouse focuses on tropical rainforests in South and Central America, Africa, Asia, and the Pacific Islands. While both of these have valuable lessons about Earth's systems and teach students important skills for dealing with environmental issues, they are teaching about topics far away from the students' local environment. Learning about different cultures around the world and their relationship with the environment is important in EE, but should come after students learn about their own culture's relationships first; this connection to local place would occur in Sobel's first two developmental levels where empathy and exploration are stressed. Rainforests are also very important to teach students about because they are home to almost half of all existing plant and animal species, but can be too large and daunting for students to understand without a background about their own local habitats. Keeping EE local and small makes it easier for students to form meaningful personal connections to systems they are directly a part of. They can then build off of this foundation to expand their understanding of larger, global concepts and issues.

Teaching units for environmental literacy

This section provides a useful guide for Language Arts teachers who are interested in fully integrating the OELP into their classroom. These units are specific to grade levels and can be used over the course a few days to a week. Teachers should reference the results section to see the details of how each of the lessons in the teaching units reaches the OELP strands. All of this information could be provided to teachers as an extra tool during the PLT trainings that are already in place.

Habitats: Pre-K through 3rd grade

Figure 1

OELP Strand		(1)	(2)	(3)	(4)	(5)
PLT Lesson	#1 The Shape of Things	#4 Sounds Around	#46 Schoolyard Safari	#4 Sounds Around #87 Earth Manners	#4 Sounds Around #87 Earth Manners	#4 Sounds Around #87 Earth Manners

In this unit, teachers use four different PLT lessons (#1, #4, #46, and #87) introduce students to different habitats. Students make observations about their local environment, draw conclusions about biodiversity, and think of ways to protect the natural habitats surrounding them. Although it does not explicitly reach any of the strands, lesson #1 The Shape of Things helps students learn how to make detailed observations and look for patterns in the environment. Lesson #4 Sounds Around takes this observation a step further as students tune into the sounds they hear in the environment and create journals and draw pictures about what they think made the sounds. Lesson #46 Schoolyard Safari gives students the opportunity to get outside and observe the habitats in their schoolyard. They continue to develop their observation skills as they record the different types of plants, animals, and signs of animals they see. Lastly, lesson #87 Earth Manners encourages students to think about how they can protect natural habitats and the animals that live within them by creating a set of guidelines on how to respectfully act when outdoors.

Habitats: 1st through 5th grade

Figure 2

OELP Strand	(1)	(2)	(3)	(4)	(5)
PLT Lesson	#4 Sounds Around #8 The Forest of S.T. Shrew #54 I'd Like to Visit a Place Where	#8 The Forest of S.T. Shrew #20 Environmental Exchange Box #54 I'd Like to Visit a Place Where	#4 Sounds Around #54 I'd Like to Visit a Place Where #87 Earth Manners	#4 Sounds Around #54 I'd Like to Visit a Place Where #87 Earth Manners	#4 Sounds Around #54 I'd Like to Visit a Place Where #87 Earth Manners

In this lesson, teachers use five different PLT lessons (#4, #8, #20, #54, and #87) to teach students about habitats and can be used for a wider range of grade levels. Lesson #4 Sounds Around has students listen closely to the sounds they hear in the environment and create their own sound maps based off of these observations. Students think about what sounds they liked and didn't like and determine if they were natural sounds or human-made. Lesson #8 The Forest of S.T. Shrew has students read a story about life in the woods from a small animal's perspective. Reading this story helps students recognize the characteristics of micro-habitats within the forest and the biodiversity that exists within them. They gain a greater understanding about the interaction between living and nonliving components of a habitat, like air, water, climate, geological features, plants and animals. Lesson #20 Environmental Exchange Box gives students a chance to learn more about the region where they live and compare it to the environment in another region. Students gather materials from different habitats to put in an exchange box to discover the characteristics of their local areas. They then compare these characteristics with an exchange box from another

region and make conclusions about what was similar, what was different, and why. Lesson #54 I'd Like to Visit a Place Where has students think about parks that they have visited and what they liked about them. Students think about the characteristics of the habitat of a park and the many ways people use and appreciate parks by listing descriptive words for each letter in the alphabet. They also discuss the importance of parks in the community. Finally, students are guided to think about their responsibility towards protecting different habitats in lesson #87 Earth Manners. They work together to make a list of guidelines on how to respectfully act when outdoors.

Plants: 3rd through 6th grade

Figure 3

OELP Strand	(1)	(2)	(3)	(4)	(5)
PLT Lesson	#13 We All Need Trees #42 Sunlight and Shades of Green	#13 We All Need Trees #42 Sunlight and Shades of Green	#13 We All Need Trees #16 Pass the Plants #5 Poet Tree	#87 Earth Manners	#87 Earth Manners

Teachers use five different PLT lessons (#5, #13, #16, #42, and #87) in this unit to teach students about different types of plants and the importance of protecting them. In lesson #13 We All Need Trees, students examine various products that are made from trees and describe the different ways trees are used to make these products. Students work in teams to draw conclusions about the diversity of tree products that humans use in our daily lives and discuss how this awareness might affect their behavior, like conservation practices. Lesson #16 Pass the Plants, Please builds on this idea of human use of plants by having students explore just how big a part plants play in our diets. Students identify edible plant parts, give examples of each, and describe how

plants are transformed to make various different types of foods. They also make a chart that closely looks at their lunches every day for one week to see how often they consume plants. Lesson #42 Sunlight and Shades of Green introduces students to the concept of photosynthesis. They test the effects of lack of sunlight on plant leaves by conducting an experiment on a tree in their schoolyard. Students learn the process of photosynthesis and how it enables plants to survive. Lesson #5 Poet Tree gives students the opportunity to express their points of view and attitudes about the environment, specifically trees, using various forms of poetry. Students use all their senses to describe trees and the influence humans have on them. In their poems, students consider the value of trees and forest products to people. After they have observed the interconnectedness of people and plants, students use lesson #87 Earth Manners to create a set of guidelines on how to treat and protect plants, and the habitats where they grow.

Observations: 1st through 6th grade

Figure 4

OELP Strand	(1)	(2)	(3)	(4)	(5)
PLT Lesson	#4 Sounds Around #8 The Forest of S.T. Shrew	#8 The Forest of S.T. Shrew	#4 Sounds Around #95 Did You Notice	#4 Sounds Around	#4 Sounds Around

This unit guides teachers on how to develop good observation skills in their students using four PLT lessons (#4, #8, #61 and #95). Although it does not explicitly reach any of the strands, lesson #61 The Closer You Look teaches students about how observation increases knowledge about plants and animals. To begin, students are asked

to close their eyes, picture a tree as best as they can, and then draw what they picture. Students then spend time outdoors examining trees in their local environment, recording as many characteristics they see as possible, and then replicating what they saw in detailed drawings. They compare the difference between their first tree drawing and their second to notice the amount of new detail about trees they noticed when making observations. Lesson #4 Sounds Around encourages students to use their sense of hearing to make observations about the environment. They make sound maps based on sounds they observe when sitting in one place for several minutes and recognize just how important hearing is to making complete observations. Lesson #8 The Forest of S.T. Shrew has students read a story about life in the woods from a small animal's perspective. Reading this story helps students observe the characteristics of micro-habitats within the forest and the biodiversity that exists within them. By reading the story through a different, smaller, perspective, students are able to observe details more closely and gain new points of view. In lesson #95 Did You Notice, students use their observation skills to study changes in their local environment over long and short periods of time. Students gather information about the history of their community to learn about the changes that have occurred in the environment, wildlife, and human lifestyle and why they happened. They further develop their observation skills by identifying any trends they see.

Changes Over Time: 5th and 6th grade

Figure 5

OELP Strand	(1)	(2)	(3)	(4)	(5)
PLT Lesson	#9 Planet Diversity #80 Nothing Succeeds Like Succession #86 Our Changing World	#9 Planet Diversity #80 Nothing Succeeds Like Succession #86 Our Changing World	#9 Planet Diversity #86 Our Changing World #40 Then and Now	#86 Our Changing World	#86 Our Changing World

This unit focuses on the changes that take place in the environment over time through four PLT lessons (#9, #40, #80, and #86). Lesson #9 Planet Diversity lays the foundation for understanding how and why environments change. This lesson has students imagine they are from another planet, coming to Earth to discover why it is so rich with various life forms. By studying a small plot of land, students make observations about what life forms they encounter, how often they saw them, if any were unique to one area, and the environmental conditions that may have effected the biodiversity of the plot. Students think about what factors influence the abundance or lack of biodiversity in an area, especially what problems might arise over time that change this. In lesson #80 Nothing Succeeds Like Succession, students explore the basic relationship between species diversity and ecosystem changes. They learn that ecosystems change over time through patterns of growth and succession and are affected by diseases, insects, fires, weather, and human intervention. Lesson #86 Our Changing World has students think about the patterns of change in Earth's global systems. By creating a diagram of natural parts and human built parts of these systems, students observe how human actions directly and indirectly effect many parts of Earth's systems and how everything is connected. Students also research global change issues

to determine what human activities may have caused these changes, how much of the Earth is effected by the changes, how to prepare for changes, and how to make positive changes with regard to the issue. Finally, lesson #40 Then and Now has students specifically look at the environment in which they live and observe the changes that have occurred in their community over time. Students look at old photos of their community to determine any changes that have taken place over time, and then conduct interviews with older community members to learn about how these changes affected their way of life.

Communities: 4th through 8th grade

Figure 6

OELP Strand	(1)	(2)	(3)	(4)	(5)
PLT Lesson	#55 Planning the Ideal Community #54 I'd Like to Visit a Place Where	#54 I'd Like to Visit a Place Where	#54 I'd Like to Visit a Place Where	#54 I'd Like to Visit a Place Where #58 There Ought to Be a Law	#54 I'd Like to Visit a Place Where #58 There Ought to Be a Law

Teachers can use three PLT lessons (#54, #55, and #58) in this unit to teach students about different types of communities and their relationship with the environment. Lesson #55 Planning the Ideal Community students understand the importance of a community's resources and how they provide for the well-being of its residents. Through brainstorming and surveying places and services they use in their community, students discover the importance of the different components that go into building a community. Students are then given an opportunity to become community planners and design an ideal community of their own. They work in groups to create a

community with well-balanced basic services and resources with social, cultural, recreational, and environmental needs. In lesson #54 I'd Like to Visit a Place Where… students explore the importance recreational areas and facilities in their community. They choose a recreational area they enjoy going to and describe what they like doing there, where it is located, what is unusual or special about it, what plants and animals live there, and why it is important for people and other living things. Students then discuss their descriptions with classmates to determine why each area is important for recreation, intrinsic aesthetic value, and for other living things. This lesson also has students think of ways they might be able to help or improve a local park or recreational area and then work with a park employee to carry their project out. Once they have learned about the different components of a community and what is important to them, students examine why rules and laws are important and essential in any community. Lesson #58 There Ought to Be a Law has students discuss the steps needed to make or change a local law and why each step is important to ensure that the law being changed or created is for the common good. Students then come up with ideas for potential laws that would address current environmental issues in their community and conduct research on how to make their idea become a law.

Conclusions

My research set out to examine lessons within the *Project Learning Tree Environmental Education Activity Guide* in order to learn how they articulated with the five strands of environmental literacy in the Oregon Environmental Literacy Plan. By comparing the forty-six Language Arts focused lessons to the OELP, I found linkages between the targeted skills and concepts within the PLT lessons and the five OELP strands. I also looked for how the lessons could help develop attitudes to make informed decisions and take responsible action, based on the guidelines in the OELP. My results affirm that majority of the lessons articulated easily with strand one (systems thinking), strand two (physical, living, and human systems), and strand three (interconnectedness of humans and the environment). While many of the lessons thoroughly discuss key components of the environment, they were not as thorough at reaching strands four and five (personal and civil responsibilities, and creating a sustainable future).

I attribute part of this pattern to the fact that learning about all environmental topics requires thinking about Earth's systems and their dynamic parts. In order to fully understand environmental processes and issues, students must be guided to think about the dynamic interconnected nature of systems, long and short term effects on them, and how to optimize outcomes within them, all of which are generally explored in strands one, two, and three. Although each of the strands is equally as important as the next, systems thinking tends to cover the most information about a topic because it encourages students to think about the big picture and take into account the structures, functions and interactions in systems to gain a more holistic understanding. This allows students to think more broadly, where the other strands have more specific goals that

must be reached: strand three requires students to think locally and globally and make connections between political, economic, physical and social environments; strand four required students to consider the overall rights of citizens, the implications of their choices, and how their individual opinions effect themselves, society, the commons, and other living people and beings; and strand five involves students applying the skills they have gained to engage in deliberation, make previously unrecognized connections, conduct research, identify problems and solutions, consider alternative perspectives, and reach evidence-based conclusions.[179] I would also conclude that concepts expressed in strands four and five are more likely show up in Social Science lessons than Language Arts ones.

In many cases, more lessons would have integrated concepts and practices that articulate with the five OELP strands if the instructor added a few simple questions to the lesson, such as "how do humans influence the environmental topic being covered?" or "how do humans depend on this topic, what responsibilities do humans have towards this topic and if so, what are possible solutions to this issue?" These questions could be used to ensure that students are making valuable connections to the real world and understanding the importance of applying what they have learned in the classroom to what is happening in their daily lives. For example, lesson #9 Planet Diversity could cover strands four and five if the instructor discussed the responsibility of humans to protect biodiversity, asked students to consider how important biodiversity is to them, and encouraged them to determine the skills and strategies necessary to carry out a plan of action to maintain the vast biodiversity that exists around them.

[179] OELP, 20-23.

This research is important to the field of environmental studies because it takes an already highly successful, widely accepted EE curriculum and illustrates how it articulates with the most recent OELP. Aligning the PLT activity guide to the OELP creates a resource for the non-formal and formal pre-K-8th grade educators in Oregon, who may or may not be familiar with teaching environmental concepts. It can also be used by the State of Oregon's Board of Education as an example of how high quality EE materials can help promote environmental literacy. It also can help teachers implement EE and environmental literacy programs in more schools across the state by providing them with the tools they need to create cohesive units of lesson plans. This research can be used as an example of how to implement activities that promote EE across multiple grade levels and through Language Arts activities. Lastly, teachers can use it to carry out the goals outlined in the Oregon State Environmental Literacy Plan by utilizing lessons that are already written, have valuable connections to the real world, and reach state standards.

There is still much more research than can be done with the PLT activity guide and the literacy plan. All of the lesson plans in PLT should be evaluated based on the five strands, not just the lessons with a Language Arts focus, but with all disciplines in all grade levels. Once this is done, the storylines of cohesive lessons that PLT has prepared in the back of the book can be examined to see if they are successful at meeting all five strands, and if they are not, they can be reorganized to do so.

Educating for environmental literacy is essential in sustaining Earth's systems as we advance our technologically focused society. The consistently changing world in which we live requires all humans to be able to understand the interrelationships

between our environment, society, and economy. Environmental literacy prepares children to understand changes in the environment by providing them with the knowledge, skills, attitudes and values to fulfill their responsibility to keeping the balance between systems and maintaining healthy, sustainable environments and communities. The PLT curriculum utilized both inside and outside of the classroom has the power to encourage and develop all of the components of literacy, making it a valuable tool in the important development of environmental education across Oregon.

The Project Learning Tree Diagram:
Each of the branches of this tree represents the five OELP strands. Attached to the branches are different colored "fruit" representing the PLT lessons that articulate the corresponding strand.

(Green-(1)systems thinking; blue-(2)physical, living, and human systems; purple-(3)interconnectedness; orange-(4)personal and civic responsibility; and red-(5)future)

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