A Program Evaluation of Connecticut Project Learning Tree Educator Workshops

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May 2012

Masters project submitted in partial fulfillment of the requirements for the Master of Environmental Management degree in the Nicholas School of the Environment of Duke University.

Abstract:

Project Learning Tree (PLT) is a national environmental education curriculum designed to help formal and informal educators integrate environmental education across disciplines and within the context of state curriculum standards. This program evaluation quantifies the impacts of Project Learning Tree educator workshops on the frequency and quality of environmental education taught in Connecticut. Data was collected through surveys of past Connecticut workshop participants (n=34) and a control group of public school educators (n=445). Analytic methods included negative binomial regression and ordered logit models. Workshop participation was not found to be a significant predictor of the extent or quality of environmental education in Connecticut. Only three variables were found to be significant ($\alpha = .05$) predictors of increased environmental education in Connecticut's public schools: educator's age, educator's contractual responsibility for science education, and working at a school with an institutional commitment to sustainability. Ordered logit model results also show that science educators have the greatest self-reported confidence levels in integrating environmental education and require the least amount of effort to prepare and teach environmental lessons.

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Background & Introduction:

Project Learning Tree (PLT) was founded in 1976 by the American Forest Foundation and the Western Regional Environmental Education Council to help guide educators utilize environmental education activities to meet state-level curriculum requirements. The program continues to be administered by the American Forest Foundation and supports formal and non-formal educators in attaining the following goals:

- Developing students' awareness, appreciation, skills, and commitment to address environmental issues.
- Providing a framework for students to apply scientific processes and higher order thinking skills to resolve environmental problems.
- Helping students acquire an appreciation and tolerance of diverse viewpoints on environmental issues and develop attitudes and actions based on analysis and evaluation of the available information.
- Encouraging creativity, originality, and flexibility to resolve environmental problems and issues.
- Inspiring and empowering students to become responsible, productive, and participatory members of society. (Project Learning Tree 2010)

The primary foci of PLT are the development of environmental education materials that "teach students how to think, not what to think about the environment" and the effective training of formal and non-formal educators in the use of these materials (Project Learning Tree 2010). Curriculum guides are developed in conjunction with agencies such as the World Wildlife Fund and World Forestry Center to ensure relevance to current issues. They are continually reviewed by technical experts for accuracy. All materials are formally tested by hundreds of classroom teachers before publication. PLT educational materials are also designed to help meet a wide range of formal learning standards including National Science Standards, National Social Studies Standards, Excellence in Environmental Education Guidelines, state learning standards, and Girl and Boy Scout badge programs.

Project Learning Tree educator workshops were first made available in Connecticut in 1978 by the Connecticut Outdoor Educators Association, a precursor to the current Connecticut Outdoors and Environmental Educators Association. Shortly after, the Connecticut Forest and Park Association (CFPA) and Connecticut Department of Energy & Environmental Protection (DEEP) became additional state co-sponsors of PLT, taking complete ownership of the program by the late 1990s. In 2000, staff turn-over caused a hiatus in the program until CFPA hired a new Education Director in 2004. From 2004-2010, the Education Director was solely responsible for administering Connecticut Project Learning Tree. In 2010, the DEEP hired a new PLT coordinator to work in partnership with CFPA's Education Director. A state-level steering committee was recently formed and charged with identifying program limitations and creating a strategic plan to guide the evolution of the program in Connecticut.

The primary activity of Connecticut PLT is training formal and non-formal educators in the philosophy and use of PLT curricular materials. Training workshops are offered regularly throughout the year and generally last for seven hours. All training workshops include the following components:

1. Philosophy of Project Learning Tree
2. Connections to the Connecticut Curriculum Framework
    a. Meeting Connecticut content standards:
        i. Language Arts: Reading & Responding, Exploring & Responding to Literature, Communicating with Others, English Language Conventions
        ii. Science: Scientific Inquiry & Literacy, Structure & Function, Heredity & Evolution
        iii. Social Studies: Places & Regions, Human and Environmental Interactions, Physical Systems
3. Experiential learning of 5-8 PLT activities
4. Practice lesson planning
5. Reading and technology connections

The newly-founded Connecticut PLT Steering Committee requested that a program evaluation be completed on the educator training workshops to help inform the committee about the efficacy of the workshops and guide work on future program improvements. The program evaluation seeks to quantify the effects of PLT training workshops on the number of environmental education lessons taught per month, educators' confidence in teaching environmental education, the level of student engagement in environmental lessons, and the relative effort it takes for educators to prepare and teach environmental education lessons.

Past Evaluations of Project Learning Tree:

Although over 1500 educators have received Project Learning Tree training in Connecticut, records only exist for the most recent 180 participants. In the history of Connecticut Project Learning Tree, there has never been any formal evaluation of workshop effectiveness in increasing the amount of environmental education taking place in Connecticut classrooms. Past evaluations in Connecticut have been limited to collecting feedback on the quality and relevance of the teacher workshops through a one-page questionnaire that participants are asked to complete at the end of each workshop.

There are numerous studies of national Project Learning Tree dating back to the 1970s that have evaluated both the quality of PLT curricular materials and the associated teacher training workshops. Before the final versions of PLT activities are published, they undergo rigorous classroom testing to ensure that learning outcomes will be met. A study by Covitt et al. (2005) showed a statistically significant ($p<.0001$) increase in students' knowledge of environmental risk assessment after completing the PLT risk education module, 'Focus on Risk'. Haines and Hermann (2011) found similar results for the 'Places We Live' module. Students who completed at least six lessons from 'Places We Live' had statistically significant ($p=.04$). increases in both content knowledge and the capacity for taking action on environmental issues.

The Covitt et al. (2005) and Haines and Herman (2011) studies also demonstrated the importance of utilizing PLT curricular materials in their entirety. Both authors found that PLT activities are less effective when used as stand-alone lessons as opposed to being integrated as part of a cohesive series. This underscores the importance of the PLT educator workshops as teachers who receive training on the integration of activities into larger units will have the most student-learning benefits.

Prior studies of national Project Learning Tree have also evaluated the educator training workshops. The most common method for making assessments was to survey educators at the conclusion of a workshop with a series of questions relating to their experience. Common topics included the length of the workshop, pace and knowledge of the facilitators, the applicability of curricular topics to state content standards, and anticipated barriers to implementing activities in the classroom. Most studies found that educators rated their PLT training experience favorably. 79% of participants surveyed in Louisiana rated the PLT workshop as being "superior" to other continuing education workshops they had attended (Culpepper 1992). 66% of participants in Oregon reported that the workshop had increased their capacity for teaching environmental education and 95% would recommend a PLT workshop to a colleague (McConney et al. 2000).

Past evaluations have also tried to capture how often educators use PLT activities in their classrooms. A number of studies surveyed teachers at the conclusion of training workshops and requested estimates of the frequency with which they expected to use PLT materials in their classrooms. Using this methodology, MacLeod (1997) found that 39% of educators who completed California PLT workshops planned to use PLT activities weekly, 36% planned to use them monthly, and 24% intended to use them several times a year. A limitation of the MacLeod study is that researchers didn't follow up with participants to see if their actual behavior aligned with their reported intentions. To correct for this, other researchers chose to contact PLT workshop participants a year or more after the workshops and for reports of how many PLT activities they had used in the previous year. McConney et al. (2000) studied Oregon PLT and found that 39% of workshop participants used PLT activities between 1 and 3 times per year, 22% used PLT activities between 4 and 6 times per year, and 15% used them between 7 and 10 times per year. 23% of workshop participants had not used PLT materials at all since their educator workshop (McConney et al. 2000). Similar findings were reported in a study of Alaska PLT in which 27% of workshop participants used PLT activities between 1 and 3 times in the previous year, 35% between 4 and 6 times, 13% between 7 and 9 times, and 25% reported using PLT activities more than 10 times in the previous year (Rogers 1996).

It is unclear from previous studies whether or not PLT workshops are actually increasing the amount of environmental education occurring within a state. Previous studies have focused solely on the classrooms of educators who had already participated in a Project Learning Tree educator workshop. Because participation in PLT workshops is voluntary, educators self-select into training, meaning that it is likely that participants differ from non-participants in systematic ways. Without a counterfactual group, it is impossible to determine whether the self-selecting educators would have implemented similar environmental education instruction in their classrooms, even without attending a workshop. If these educators were motivated enough to seek out PLT training, it may be that they would have implemented similar activities through an alternate venue. While previous studies can attest to issues such as the power of PLT materials

to increase students' knowledge of environmental topics and the percentage of workshop participants who actively use PLT materials in their classrooms, they cannot answer the question of whether or not participation in a PLT workshop makes an educator more likely to incorporate environmental education in the classroom than an educator who has not received the training.

This study seeks to measure whether or not Connecticut Project Learning Tree Educator Workshops are increasing the amount of environmental education occurring in Connecticut classrooms. Instead of surveying only PLT-trained educators, this study built a counterfactual using a control group of Connecticut public-school educators who had never received PLT training. By comparing the amount and quality of environmental education being taught by both the treatment and control groups, the impact of the PLT training workshop on overall levels of environmental education can be assessed.

Survey Methods:

Data was collected through surveys of past Connecticut Project Learning Tree workshop participants and a control group of Connecticut public-school educators. All focus group and survey activities were approved by Duke University Institutional Review Board, Protocol #A0802. Contact information for past PLT participants was obtained from workshop registration forms kept on file by the Connecticut Forest & Park Association and the Connecticut Department of Energy and Environmental Protection. The control group was constructed by contacting all public-school principals in Connecticut and requesting permission to distribute surveys to their staff. Permission was received for 39 schools representing 26 different school districts around the state. A full list of the participating schools and districts is available in Appendix A. Because permission was needed to contact control group educators, random sampling of all Connecticut educators was not feasible for this study.

The survey was developed in cooperation with the Connecticut Project Learning Tree Steering Committee who outlined information needed to proceed with their planning efforts. A draft of the survey was pre-tested by a focus group of ten educators. The focus group was given as much time as they needed to complete the survey and were then asked a series of questions, including:

1. What was your initial reaction to the length of the survey?
2. Was the meaning of any of the questions unclear?
3. Did any questions collect duplicate information?
4. Were there any questions missing a category of responses?

The educators were also asked to critique a number of different definitions of environmental education. An agreed-upon definition would be included in the final survey to ensure that all respondents had a similar idea of what constitutes environmental education when answering the survey questions. Guiding questions for this part of the discussion included:

1. Do these definitions help you understand the difference between environmental education and more conventional science education? Do you think that other educators will be able to make this distinction, working with the definitions given? Does one definition do a better job than the others?

2. Do the definitions give enough flexibility that interdisciplinary activities could still be counted?

Web-based surveys were distributed to control group educators through their respective principals. Each principal was sent a cover letter and survey link to be forwarded on to their staff. All educators received at least one reminder email exactly one week before the survey closed. Surveys were initially distributed to the PLT educators through email. A hard-copy version was mailed out approximately one month later in an attempt to increase the response rate. The cover letter included with the hard-copy mailing requested that educators who had already completed the web-based survey not fill out the hard-copy to avoid double-counting.

Table 1. Sections of Control and Treatment Group Surveys

Control Group	Treatment Group
Informed Consent	Informed Consent
Demographics	Demographics
Environmental Education in the Classroom	PLT Educator Workshop & Curriculum Materials
Indicators of Personal/Institutional Interest	Environmental Education in the Classroom
Planning for Future Workshops	Indicators of Personal/Institutional Interest
	Planning for Future Workshops

Table 1 provides an outline of the sections included in the control and treatment group surveys. Both surveys began with an informed consent statement that included information about the objectives of the study, assurances of confidentiality, and language which emphasized the voluntary nature of participation. Demographic information was then collected. The Connecticut PLT Steering Committee and educator focus group helped identify the demographic characteristics that would be most likely to impact the amount of environmental education taught by a given educator. Both sources agreed that age, gender, years of teaching experience, past occupational changes, grade levels and subjects taught, and school district affiliation were the most important demographic information to collect.

The "Environmental Education in the Classroom" section queried respondents about the number of environmental education lessons taught per month, their level of confidence in teaching environmental education, the amount of effort it takes to prepare for environmental lessons, and levels of student engagement. Because there is no single definition for what constitutes environmental education, the survey provided respondents with a reference definition in order to better standardize responses across educators. The definition of environmental education provided in the survey was modeled on the classic definition first promoted by Dr. William Stapp in 1969: "Environmental education is aimed at producing a citizenry that is knowledgeable concerning the biophysical environment and its associated problems, aware of how to help solve these problems, and motivated to work toward their solution (Stapp 1969)." Stapp's definition was the first to draw a clear line between environmental education and more conventional science education. Environmental education differentiates itself with its triple focus on the science underlying environmental issues, awareness of potential solutions, and the empowerment of students to work towards solutions.

The focus group offered several modifications to Stapp's definition in order to elucidate its meaning for educators who may not have a strong background in science or environmental education. Focus group educators wished to expand the "biophysical environment" to "the environment". They also felt that appreciating the natural world was an important component of environmental education not included in Stapp's original definition. One of the focus group educators taught music in an elementary school and felt that many art and music teachers wouldn't be able to recognize their work in Stapp's definition. She recommended adding "appreciate the natural world" to capture the contributions of lessons such as listening to music inspired by the natural world and discussing its origins. All of the focus group educators also agreed that it would be helpful to provide a bulleted list with examples of different types of environmental education lessons, particularly those outside of standard science education.

The final definition and survey instructions were as follows:

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For the purposes of this survey, environmental education is defined as:

"Education aimed at producing citizens who are knowledgeable about the environment, appreciate the natural world, and are motivated to investigate and take action towards solutions for environmental problems (Stapp 1969)."

Environmental education is not limited to science lessons. The following are all examples of environmental education:

- Reading and discussing nature writing
- Listening to and discussing music inspired by the natural world
- Studying environmental movements historically
- Working on art projects with natural materials or inspired by the natural world

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The "Indicators of Personal/Institutional Interest" section contained questions which gauged an educator's personal commitment and school's institutional commitment to environmental sustainability. There were questions to indicate membership in environmental organizations and a check-list of common sustainability practices in elementary, middle, and secondary schools. Educators were asked to check all of the practices currently operating within their school. Sustainability practices were compiled from the following sources: The Green Schools Initiative, the Illinois Environmental Protection Agency Green Schools Checklist, and the U.S. Green Building Council's Center for Green Schools.

The survey administered to Project Learning Tree educators contained an additional set of questions to elicit information about educators' experience with Project Learning Tree specifically. The first questions in this section asked educators about their initial motivation for attending a PLT workshop and the frequency of use of specific PLT curriculum guides. Respondents were asked to provide the names of PLT activities used most frequently and to rate the helpfulness of different sub-sections of the guides. Sub-sections included appendices, indices, technology connections, differentiated instruction, reading connections, background information, and assessment opportunities. Finally, respondents were asked to indicate their

level of agreement with a series of statements reflecting the desired outcomes of the workshops. These outcomes included increasing an educator's confidence in teaching environmental education, reducing the amount of time it takes to prepare and teach environmental lessons, and helping educators meet curriculum requirements using environmental education.

The final section in both the control and treatment group surveys contained questions pertaining to educators' preferences around professional development opportunities. Questions in this section collected information that will be used by the Connecticut Forest & Park Association and Connecticut Department of Energy & Environmental Protection in scheduling and formatting future PLT educator workshops. Respondents were asked about their level of interest in online trainings and if they would elect to attend an online training over an in-person opportunity. Respondents were also asked to rank their top three preferred days of the week and months of the year to attend professional development opportunities. The final question of the survey asked if there was anything else that educators would like to share about their experiences with environmental education or Project Learning Tree specifically. This question was included to capture any anecdotal evidence that educators might offer about their experiences and to give respondents room to express any thoughts or concerns that might have arisen during completion of the survey.

At the conclusion of each survey, participants were given the option of entering their name into a drawing for their choice of either a $50 Visa gift card or a set of Connecticut Walk Books. Participants could enter the survey by sending an email with their preferred contact information to the researcher. Emails were sent external to the collection of survey responses to ensure the anonymity of responses. A random drawing was used to select a winner for both the treatment and control groups.

A full version of the treatment group survey can be found in Appendix B. Control group participants received the same set of questions with the exception of the section dedicated to educators' experience with Project Learning Tree specifically.

Survey Data:

The control group for this study was comprised of Connecticut public-school educators, from kindergarten through twelfth grade. Random sampling was not possible due to the permissions needed before contacting educators to participate. A total of 445 educators representing 39 different schools and 26 school districts make up the control group. A complete break-down of schools and school districts represented can be found in Appendix A. The overall survey response rate for the control group was 24.5%. When calculating summary statistics, observations with missing values were dropped.

The treatment group for this study consisted of past participants in Connecticut Project Learning Tree workshops. Updated contact information was only available for the 180 most recent trainees which ensured that all participating educators completed their training between 2004 and 2011. It proved difficult to amass survey responses from the treatment group. This may be due to the limited communication between trainers and PLT educators after the conclusion of the workshop. The treatment group consists of 34 educators representing 20 different school

districts. This gives an overall response rate of 19.2% of PLT-trained educators that were contacted. Similar to the control group, observations with missing values were dropped when calculating summary statistics for the treatment group. Therefore, the number of observations varies between variables reported.

The size of the treatment and control groups gave this study a statistical power of only 10.1%. If a treatment effect is present, statistical power indicates likely it is that the study will be able to detect it. If a true treatment effect existed for the Project Learning Tree workshops, it would only be detected in 10.1% of samples of the same size used in this evaluation. The statistical power for this study may be somewhat higher than the calculated 10.1% because of the large number of variables controlled for in the regressions.

Table 2. Summary Statistics for Control and Treatment Groups

	Control		Treatment	
	Mean	# obs.	Mean	# obs.
	(s.d.)		*(s.d.)*	
Age	42.84	426	48.03	32
	(11.36)		*(13.68)*	
Experience	14.85	427	19.06	33
	(9.99)		*(11.83)*	
District Reference Group	3.96	433	5.38	32
	(2.15)		*(2.56)*	
Urban-Rural	5.58	433	5.03	32
	(2.45)		*(2.80)*	
Green School	3.55	439	3.57	32
	(2.26)		*(2.53)*	
Gender [1]	.73	439	.91	32
Environmental Membership[2]	.20	439	.32	34

The mean age of educators in the control group is 42.84 years, with a standard deviation of 11.36 years. The distribution of age within the control group is fairly normal. The mean age of educators in the treatment group is 48.03 years, with a standard deviation of 13.68 years. A t-test showed that the mean age of educators in the treatment group is significantly different from the mean age of educators in the control group ($p= 0.019$) and will need to be controlled for in future regressions.

The mean years of teaching experience for educators in the control group is 14.87 years, with a standard deviation of 9.97 years. The distribution of experience in the control group has a right-skew which was a surprising result. It was hypothesized that the distribution experience would

[1] Gender was coded as a dummy variable with a value of 1 for females and 0 for males. A mean of .73 translates to 73% of the control educators being female.
[2] Environmental membership refers to membership in a conservation-oriented organization. This dummy variable takes a value of 1 for members and 0 for non-members.

mirror the distribution of educators' ages. Although the correlation coefficient between age and experience was 0.78 (p= 0.00), it was found that nearly half the educators (43.05%) in the control group were employed in another occupation prior to teaching. Therefore, the high frequency of educators with less than 10 years of teaching experience can potentially be explained by individuals changing careers and beginning to accrue years of teaching experience at a later age. The mean years of teaching experience in the treatment group is 19.06 years, with a standard deviation of 11.83 years. A t-test demonstrated that the mean years of teaching experience in the treatment group is significantly different than the mean in the control group (p= 0.022).

The state of Connecticut assigns school districts to District Reference Groups (DRGs), based on indicators of socioeconomic status, need, and enrollment. Variables used to calculate DRG include median family income, parental education, parental occupation, the percentage of children in single-parent families, the percentage of children eligible for free or reduced-price meals, the percentage of children speaking a language other than English at home, and the number of students attending school within the district (Canny 2006). There are nine DRGs within Connecticut, ranging from A (most affluent) through I (most need). All five of the major cities in Connecticut are included in DRG I (Canny 2006). A district's DRG is expected to influence the amount of environmental education that occurs in district classrooms because it is hypothesized that more affluent districts will have more resources to dedicate to staff training and institutional sustainability practices more generally.

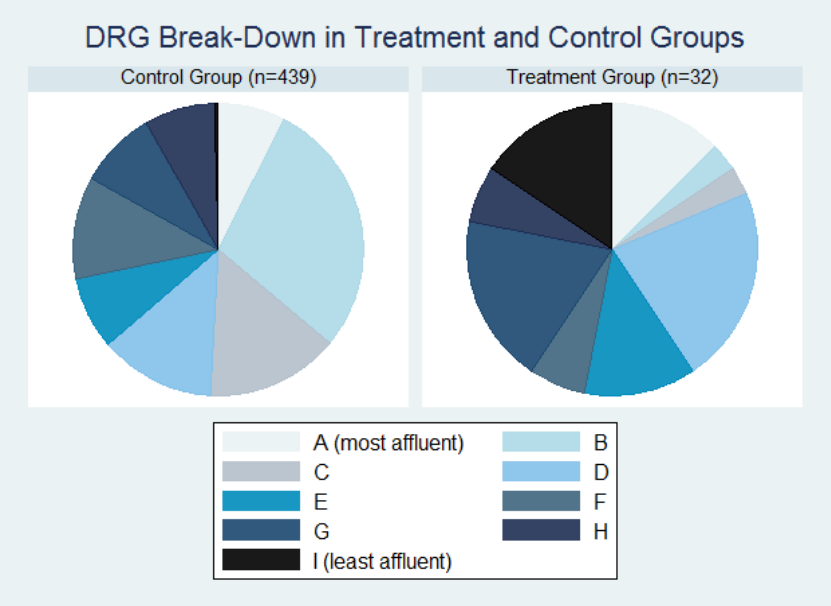

Figure 1. District Reference Group Representation

Figure 1 shows the break-down of DRGs within the treatment and control groups. The mean DRG for the control group is 3.97 which corresponds to DRG D. The median DRG has a value of 3 which corresponds to DRG C. The DRG group with the highest representation is group B which captures 28.47% of educators within the control group. The mean DRG for the treatment group is 5.38 which corresponds to DRG E. The median DRG for the treatment group has a value of 4 which corresponds to DRG D. The DRG group with the highest representation is also DRG D which captures 21.88% of educators within the control group. The p-value for Fisher's exact test[3] was 0.00, meaning that there is a statistically significant relationship between DRG and classification into the treatment or control group. Therefore, DRG will be controlled for in future regressions.

[3] The chi-square test assumes that every cell within the test has a frequency of at least five observations. Fisher's exact test replaces the chi-square test when there are cells with less than five observations.

Each school district was assigned an urban-rural classification to explore how an urban setting might influence the amount of environmental education occurring in district classrooms. It was hypothesized that educators in rural districts would teach more environmental education because of easier access to natural areas and having greater percentages of residents engaged in agricultural or natural-resource oriented activities. The degree of urbanization of each district was represented by the urban-centric locale codes used by the National Center for Education Statistics to categorize school districts nationally. There are 12 urban-centric locale codes ranging from "City, Large: Territory inside an urbanized area and inside a principal city with population of 250,000 or more" to "Rural, Remote: Census-defined rural territory that is more than 25 miles from an urbanized area and is also more than 10 miles from an urban cluster." (Phan and Glander 2007). Higher values correspond to increasingly rural districts.

The mean urban-rural classification for the control group was 5.58 which falls half-way between a midsize suburb ("territory outside a principal city and inside an urbanized area with population less than 250,000 and greater than or equal to 100,000") and a small suburb ("territory outside a principal city and inside an urbanized area with population less than 100,000") (Phan and Glander 2007). The standard deviation of the urban-rural classification in the control group was 2.45. The mean urban-rural classification for the treatment group was 5.03 with a standard deviation of 2.80. The urban-rural classifications with the greatest representation in the treatment and control groups were the large suburb, fringe town, and rural fringe. Fisher's exact test showed that there was a statistically significant relationship between urban-rural classification and being in either the treatment or control group ($p=0.00$).

School districts were also assigned a rating to represent their institutional commitment to sustainability. As part of the "Indicators of Personal/Institutional Interest", respondents were presented with a list of sustainability practices for educational institutions and were asked to check all practices that their schools currently had in place. The 14 different sustainability practices included in the survey can be found in Table 3. The number of practices was summed for each respondent and used as a rating to show the relative institutional commitment to sustainability between schools. The mean rating for the control group was 3.55 with a standard deviation of 2.26. The mean rating for the treatment group was 3.57 with a standard deviation of 2.53. A t-test showed that this difference is not significantly different from zero ($p=0.96$). The three most common sustainability practices reported in the control group were recycling of paper and plastic, encouraging double-sided copying, and using energy efficient lighting. The three most common sustainability practices reported in the treatment group were recycling of paper and plastic, Earth Day celebrations, and using energy efficient lighting.

Table 3. Sustainability Practices

School Garden	Staff/Faculty "Green Team"
Nature Trail	Outdoor classroom
Recycling of paper and plastic	Composting for food waste
Recycling of electronic wastes	Earth Day celebrations
Use of energy efficient lighting	Serve local food in the cafeteria
Encourage walking/biking to school	Display an environmental policy statement
Student "Green Team"	Encourage double-sided copying

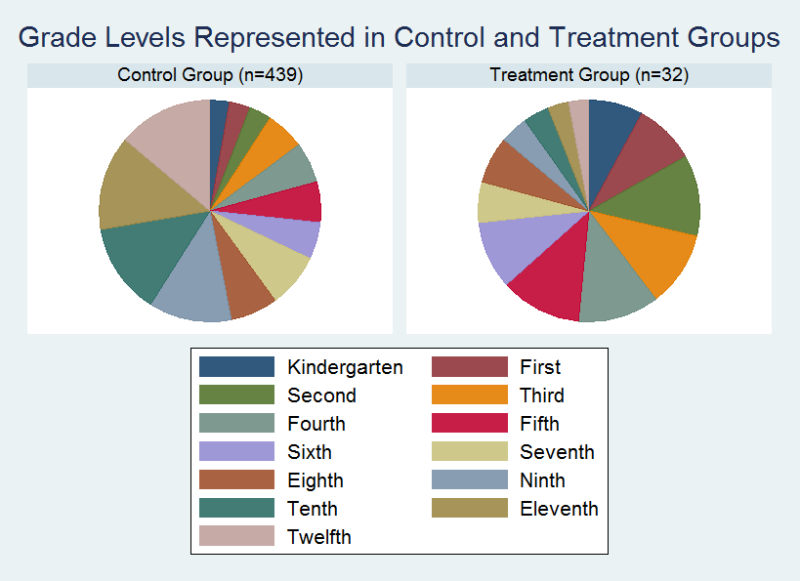

Figure 2. Grade Level Representation in Treatment and Control

Figure 2 shows the break-down of grade levels taught by educators in the treatment and control groups. 61.21% of educators in the control group and 44.1% of educators in the treatment group taught more than one grade level. As can be seen in Figure 2, the control group had a significantly higher percentage of high school teachers (grades 9-12) represented than the treatment group. Approximately half of the control group taught high school while the other half was comprised of educators in kindergarten through eighth grade. The disproportionate number of high school teachers represented in the control group was due to greater participation from high school principals in the survey recruitment process.

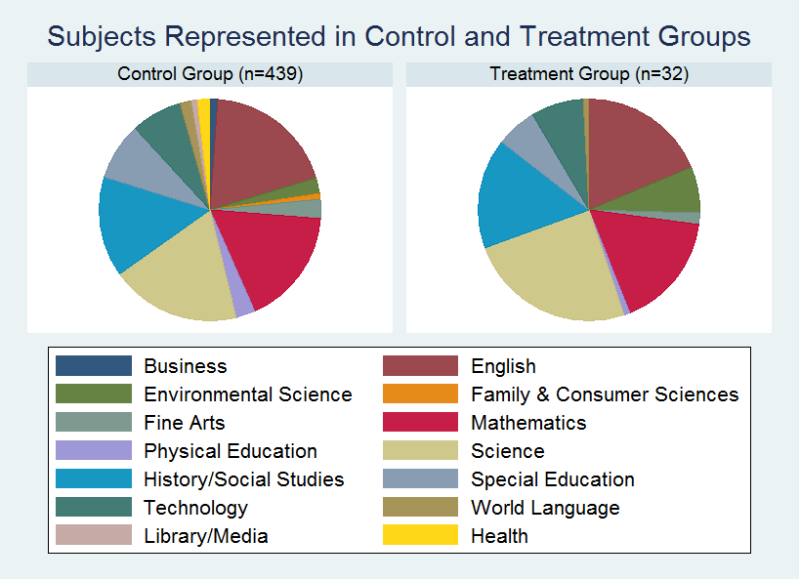

Figure 3. Subject Representation in Treatment and Control

Figure 3 shows the break-down of the subjects taught by educators in the treatment and control groups. 37.92% of educators in the control group and 76.47% of educators in the treatment group taught multiple subjects. Because there was a higher percentage of high school teachers in the control group, there was also a larger number of subjects represented. Subjects well-represented in the control group but absent from the treatment group included business and family and consumer sciences.

Data on the gender of respondents was also collected. 74.25% of the control group was female as opposed to 91.18% in the treatment group. This variation is significantly different from zero ($p=0.02$) so will need to be controlled for in future regressions.

The final piece of demographic information collected from respondents was whether they worked in another career field prior to teaching. It was hypothesized that educators who had

worked outside of academia prior to their current teaching career may be more likely to incorporate experiential learning activities such as environmental education. It was found that 43.05% of educators in the control group and 35.29% of educators in the treatment group held another career prior to teaching. A t-test showed that that this difference was not significantly different from zero at 5% (p=0.38).

Figure 4 shows the distribution of survey responses from the treatment and control groups across the state. Darker shades of red indicate that a higher percentage of survey responses was received from the district. Although different districts are represented in the control and treatment groups, both groups have similar percentages of educators coming from the different urban-rural classifications across the state.

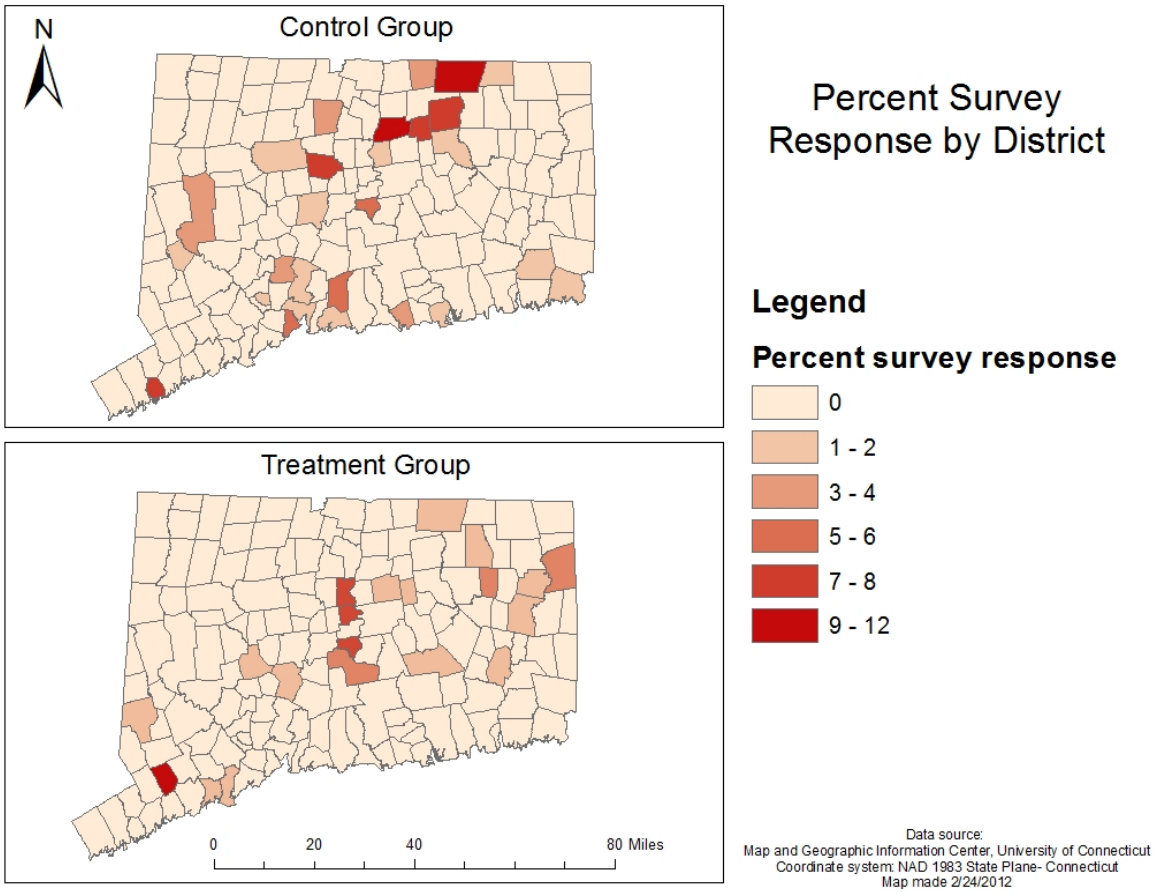

Figure 4. Percent Survey Response by School District

In order for the results of this study to explain the impacts of Project Learning Tree and the frequency and efficacy of environmental education in Connecticut more broadly, it is important that the control group be representative of the whole population of Connecticut educators. Table 4 shows a comparison of summary statistics for the entire population of Connecticut educators and the control and treatment groups for this study. As can be seen in Table 4, the control group is well-representative of Connecticut educators.

Table 4. Demographics of Connecticut Educators

Means	Connecticut	Control	Treatment
Age (years)	43.4 [4]	42.92	48.03
Years Experience	13.1[5]	14.8	19.1
Gender (% female)	73.3% [6]	74.08%	91.18%

Analytic Methods and Results:

Adequate representation from a wide range of grade levels and subject areas was a real concern for the control group of this study. Because participation by principals and educators was entirely voluntary, it is possible that participants differed from non-participants in systematic ways. Of particular concern was that educators in disciplines outside of science wouldn't consider the survey relevant to their teaching and therefore, would not respond. Because Project Learning Tree emphasizes the importance of interdisciplinary environmental education, it was important that educators from all discipline areas be represented. Language was included in both the cover letter and informed consent statement emphasizing the helpfulness and validity of responses from all subject areas. Educators were requested to respond to the survey even if they weren't actively teaching environmental education at all. Incentives appealing to a wide range of individuals were also offered to increase the response rate.

Appropriate representation of grade levels and subject areas was also a concern within the treatment group. There were only 34 treatment group educators who submitted usable survey responses, making for a small sample size to begin with. Similar to the control group, it is possible that survey respondents differed from non-respondents in systematic ways. The survey did take a small investment of time and energy so respondents had to be motivated to participate, despite the incentives being offered. If respondents who utilized their PLT training more often or had a personal interest in environmental issues comprised the bulk of respondents, this would skew the results. Information on institutional commitment to sustainability and membership in environmental organizations was collected for use as a proxy for interests that might influence the likelihood of responding to the survey.

In order to control for potential differences between the treatment and control groups, t-tests and Fisher's exact tests were performed on pre-determined characteristics to verify whether or not they were "as good as" randomly assigned. T-tests were performed on age, years of teaching

[4] Connecticut State Department of Education, 2011
[5] Connecticut State Department of Education, 2008
[6] Connecticut State Department of Education, 2011

experience, gender, institutional commitment to sustainability, and environmental organization membership. Fisher's exact tests were performed on district reference group and urban-rural classification. Of these variables, only the difference in levels of environmental organization membership was found not be significantly different from zero at 5%. Therefore, age, years of teaching experience, gender, institutional commitment to sustainability, district reference group, and urban-rural classification were controlled for in future regressions.

Number of Environmental Education Lessons Taught per Month:

The first outcome variable examined was the number of environmental education lessons being taught per month. Control group educators reported teaching a mean of 3.9 lessons per month with a minimum of 0 lessons and a maximum of 110 lessons. It seemed unlikely that an educator would have a chance to teach 110 independent environmental education lessons per month so a sensitivity analysis was performed to see how transforming the large outliers would impact results. One transformation truncated the maximum number of environmental education lessons taught per month at 30 and a second transformation divided any lessons above 100 by 9. The assumption for the second transformation was that educators may have mistakenly reported the number of environmental lessons taught per year instead of per month. Because there are 9 months in the school year, dividing the number of lessons by 9 should correct back to the average number of lessons per month. A final transformation dropped all observations with a number of lessons greater than 30. None of the transformations changed the significance of explanatory variables in the regressions so the original data was used and reported.

A negative binomial regression model was used to estimate the effects that different educator and district characteristics might have on the number of environmental education lessons taught per month.[7] The number of lessons is count data, meaning that all observations must have non-negative integer values. Because there is no restriction in ordinary least squares regression (OLS) to prevent the method from returning negative coefficient estimates, OLS cannot be used with count data. A standard poisson regression would not be appropriate for this data because it assumes that variance is equal to the mean. The data for this study appears to be over-dispersed, meaning that the variance is greater than the mean. Over-dispersion in the data is indicated by an alpha value of 1.12 and a p-value of 0.00 for the goodness-of-fit test following a test poisson regression. A negative binomial model was ultimately selected. Negative binomial regression approximates a poisson distribution, $f(r;\lambda) = (e^{-\lambda} * \lambda^{r})/r!$, that gives the probability of observing exactly *r* events over a given interval when the expected number of events is λ. This ensures that non-negative integer estimates will be returned.

The negative binomial regression model specified in Table 5 was designed to control for several categories of independent variables that could potentially influence the amount of environmental

[7] In order for the negative binomial regression to produce unbiased estimates of the standard errors on coefficients, the assumption of homoskedasticity, $\text{var}(\mu|x) = \sigma^2$, must be met. The residuals vs. fitted plot showed that data is heteroskedastic, with variance increasing as values increase. Heteroskedasticity is also indicated by the Cook-Weisberg test for heteroskedasticity. This test returned a chi^2 value of 0.00 which leads us to reject the null hypothesis of homoskedasticity. Therefore, in running regressions in STATA, it was necessary to use the "robust" command to obtain accurate standard error estimates.

education being taught in a given classroom. Although relatively few variables turned out to be significant, variables that could be intuitively related to the frequency of environmental education were left in the model to avoid introducing bias through omitted variables.

A dummy variable, "plt", was used in the regression to capture the effects of the PLT educator workshop training. The dummy variable took a value of 1 when educators had been through the training and a value of 0 otherwise. The impacts of the workshop were not significant in this model.

The second set of independent variables controlled for within the regression was an educator's age and years of teaching experience. It was hypothesized that older teachers with more years of teaching experience would be better able to integrate environmental education despite strict state curricular requirements. Age was found to be significant at 5% and had a positive coefficient of .026, indicating that for each unit increase in age, one can expect to find a 2.6% increase in the number of environmental education lessons taught per month. Experience was not significant at 5%. Although age and experience were expected to follow a similar trend, the large percentage of career-changers prevented the close correlation originally anticipated. Both a dummy variable representing career changers and an interaction term between career changers and years of experience were also included within the regression. Neither was found to be significant.

Grade level dummy variables were incorporated to account for the impacts of curricular requirements and student ability levels differing between grades. None of the grade level dummy variables were significant at 5% though fifth grade would have been significant at 10% (p-value=0.079). An F-test for joint significance gave a p-value of 0.66 meaning that all grade levels considered together are not a significant predictor of the frequency of environmental education.

Subject specific dummy variables were also included in the regression. A number of subjects were found to be significant at 5% including math, physical education, and science. The coefficient estimate on science was positive meaning that an educator's contractual responsibility for teaching science results in an increased number of environmental education lessons being taught. This is not a surprising result given that the subject matter required of science educators is directly relevant to many environmental concepts, giving science educators more of an opportunity to integrate these lessons. The coefficient estimates on math and physical education were negative meaning that teaching in one of these disciplines will significantly decrease the amount of environmental education being taught.

Educators in this study worked in schools with a wide range of institutional commitments to sustainability. The variable "greenschool" was used to explore the potential impacts that working for a school with a stronger institutional commitment to sustainability could have on the amount of environmental education occurring in building classrooms. The variable took the value of the reported number of sustainability practices currently used within the educators' schools. These practices were selected from a list specified within the survey. Greenschool had a positive coefficient which was significant at 5%. This result is logical because it is easy to imagine that schools with more sustainability practices may provide their educators with more resources to teach environmental education or allow more flexibility within curricular

requirements. It was initially hypothesized that schools with more sustainability practices in place were likely to be from wealthier districts so dummy variables were included for each district reference group within Connecticut. None of the district reference dummies were significant at 5%.

The dummy variable for gender was significant at 5% and the negative coefficient indicated that being female resulted in a decreased amount of environmental education. It is likely that this result can be explained by the very small number (n=3) of males educators within the treatment group.

The final variable controlled for within the regression was the urban-rural classification of an educator's school district. This variable was significant at 5% and had a coefficient of -0.08. This means that as school districts become progressively more rural, the amount of environmental education being taught decreases. This was a surprising result because it was hypothesized that rural districts would teach more environmental lessons because of easier access to natural areas and having greater percentages of residents engaged in agricultural or natural-resource oriented activities.

Table 5. Regression Results for Number of Environmental Education Lessons

	Coefficient	P > z [8]	95% Confidence Interval	
plt	.1929362	0.454	-.3126447	.6985171
experience	-.0357094	0.172	-.0869176	.0154987
age	.0262094	0.022 **	.0038089	.04861
kindergarten	.1246099	0.673	-.4537906	.7030103
first	-.0090879	0.980	-.7114405	.6932648
second	-.1588543	0.580	-.7220751	.4043664
third	-.1928429	0.355	-.6014932	.2158074
fourth	.2210622	0.272	-.1732398	.6153642
fifth	-.4184149	0.079 *	-.8846023	.0477725
sixth	-.2756776	0.268	-.7636622	.2123071
seventh	.1082081	0.705	-.451648	.6680643
eighth	.0420051	0.875	-.4820618	.566072
ninth	.2604333	0.244	-.177531	.6983977
tenth	-.2040867	0.396	-.6756442	.2674709
eleventh	-.4932337	0.194	-1.237301	.2508337
twelfth	.4442965	0.238	-.2936585	1.182251
business	-1.020405	0.065 *	-2.104228	.0634181
english	-.1598319	0.426	-.5531684	.2335046
famsci	-.1080128	0.702	-.6605723	.4445466
finearts	.4937482	0.289	-.4185596	1.406056
math	-.4573129	0.031 **	-.8731996	-.0414262
physed	-1.216749	0.008 ***	-2.111673	-.3218237
science	.8005999	0.000 ***	.4373936	1.163806
socstudies	.1267002	0.596	-.342009	.5954093
sped	.1407776	0.520	-.2883285	.5698838
tech	.0970514	0.648	-.319845	.5139478
language	-.503348	0.112	-1.124892	.1181965
library	-.5490212	0.102	-1.207636	.1095936
health	.212618	0.622	-.6314971	1.056733
otherjob	-.3701889	0.168	-.8965562	.1561784
greenschool	.1238862	0.000 ***	.0554739	.1922985
female	-.4715003	0.015 **	-.8527	-.0903006
urban	-.0833627	0.036 **	-.1611292	-.0055961
_Idrg_1	-.1377172	0.742	-.9574626	.6820282
_Idrg_2	-.1176805	0.715	-.7494945	.5141334
_Idrg_3	.2995717	0.366	-.3497471	.9488906
_Idrg_4	-.0995915	0.763	-.747074	.547891
_Idrg_6	.3699955	0.274	-.2935176	1.033509
_Idrg_7	-.6425707	0.089 *	-1.383005	.0978637
_Idrg_8	-.2133904	0.614	-1.043001	.6162197
_Idrg_9	.5968395	0.196	-.3076794	1.501358
exp_otherjob	.0048473	0.730	-.0227236	.0324183
yes_envmem~r	.2691451	0.099 *	-.0509821	.5892724
_cons	.7743482	0.329	-.7809219	2.329618

[8] *** p < .01, ** p < .05, * p < .10

Ordinal Variables: Confidence, Student Engagement, and Effort to Teach and Prepare Environmental Education Lessons

The number of environmental education lessons taught per month was measured using count data which necessitated a negative binomial regression model. Data on the remaining four outcome variables was collected using Likert scale ratings, making this ordinal count data. There is an implied ranking between different values for ordinal data and in the case of the Likert scales used in this survey, there is no standard interval for moving between the different values. For example, the first Likert scale question asked respondents: "How confident do you feel in your ability to integrate environmental education activities in your classroom?" The answer choices for this question were "very confident", "somewhat confident", "neutral", "somewhat unconfident", and "not at all confident". There are no standard criteria for moving between these levels of confidence and one respondent's "somewhat confident" rating doesn't necessarily correspond to that of another.

In order to address the challenge of not being able to measure the difference between Likert scale levels, an ordered logit model was used to analyze the data for the ordinal count variables. The coefficient estimates for the ordered logit were exponentiated to obtain the odds ratios displayed in Tables 6-9. An odds ratio of greater than one indicated that an educator was more likely to report a higher Likert scale rating for the given question. An odds ratio of less than one indicated that an educator was more likely to report a lower rating. The results of the ordered logit model are not definitive because the model failed the approximate likelihood-ratio test of proportionality of odds[9] across response categories. The small sample size of the treatment group was also problematic.

As can be seen in Table 6, five different variables were found to be significant predictors of an educator's confidence in integrating environmental education in the classroom. Being female and being a math teacher were significant predictors of having lower levels of confidence. Science teachers, older teachers, and members of environmental organizations were significantly more likely to report having higher levels of confidence.

Educators were also asked about the amount of effort it took to prepare and to teach an environmental education lesson. The full results from this model can be found in Table 7 and Table 8, respectively. A contractual responsibility for teaching science increased the odds of requiring less effort to prepare and teach an environmental lesson. This result makes sense because environmental education topics are highly relevant to a science teacher's required curriculum. Being a math teacher was a significant predictor of requiring more effort to integrate environmental education. Increased years of teaching experience was also a significant predictor of requiring more effort which was a surprising result because it was hypothesized that teachers with more experience would have an easier time adapting their curricula.

[9] The proportionality of odds assumption posits that the coefficients estimated by the ordered logit model are able to explain the relationship between all pairs of outcome groups. An example of a pair of outcome groups could be the lowest value category and all of the higher categories taken together. In this case, the estimated coefficient should be able to explain the relationship between the lowest value category and all of the higher categories while also explaining the relationship between the next lowest category and all higher categories (UCLA Academic Technology Services).

The final Likert scale question asked educators to rate their students' level of engagement and participation in environmental education lessons as compared to more standard lessons. Only two variables were found to be significant predictors of increased student engagement. The first was the urban-rural classification of the school district with more urbanized schools experiencing significantly higher levels of student engagement in environmental education. The second significant variable was being part of district reference group B. Student engagement was the only regression in which any district reference groups were significant so it is likely that this result can be attributed to the uneven distribution of district reference groups throughout the treatment and control groups. The full results of the student engagement regression can be found in Table 9.

Table 6. Regression Results for Educators' Confidence

	Odds Ratio	P>z [10]	95% Confidence Interval	
plt	.903788	0.819	.3795586	2.15206
experience	1.01388	0.683	.9489083	1.083301
age	.9655886	0.010 ***	.9400366	.9918353
kindergarten	2.718199	0.062 *	.95081	7.770852
first	.5437861	0.237	.1979062	1.494159
second	.9905402	0.983	.4070277	2.410573
third	.8699474	0.676	.4530132	1.67061
fourth	.8911218	0.724	.4704453	1.687971
fifth	.7178239	0.321	.3729236	1.381707
sixth	1.55462	0.160	.8395401	2.878771
seventh	1.805271	0.072 *	.9478855	3.438183
eighth	.8530479	0.626	.4497737	1.617904
ninth	.8464765	0.610	.4463723	1.605213
tenth	.9815873	0.956	.5051011	1.907566
eleventh	1.087917	0.860	.4278575	2.766257
twelfth	.9223189	0.859	.3767521	2.257909
business	1.23963	0.757	.3172605	4.843602
english	.814602	0.435	.4868387	1.363032
famsci	.8602192	0.836	.2061772	3.589034
finearts	.6843367	0.466	.247084	1.895375
math	3.362663	0.000 ***	1.958145	5.774598
physed	1.671115	0.307	.624387	4.472587
science	.323272	0.000 ***	.1963575	.532217
socstudies	1.037293	0.896	.5993677	1.795185
sped	1.787961	0.036 **	1.038469	3.078381
tech	.6369765	0.128	.3565044	1.138104
language	.4209051	0.115	.1435269	1.234341
library	.6190248	0.564	.1213548	3.157615
health	.532007	0.298	.1622815	1.744077
otherjob	.9339548	0.852	.4552779	1.91591
greenschool	.9781442	0.638	.8920828	1.072508
female	2.159538	0.003 ***	1.29526	3.600518
urban	.974049	0.644	.871271	1.088951
_Idrg_1	.6258268	0.388	.2160258	1.813021
_Idrg_2	.9528508	0.912	.4043701	2.245281
_Idrg_3	1.005171	0.991	.406328	2.486585
_Idrg_4	1.14178	0.776	.4574321	2.849958
_Idrg_6	.9269123	0.870	.3727638	2.304854
_Idrg_7	1.455497	0.485	.5070139	4.178327
_Idrg_8	1.136709	0.821	.3745525	3.449733
_Idrg_9	.3861305	0.292	.0657431	2.26787
exp_otherjob	.9987987	0.951	.9612951	1.037765
yes_envmem~r	.3717907	0.000 ***	.2291583	.6032004

[10] *** p < .01, ** p < .05, * p < .10

Table 7. Regression Results for Effort to Prepare

	Odds Ratio	P>z [11]	95% Confidence Interval	
plt	1.253962	0.660	.4574538	3.437331
experience	.9206826	0.030 **	.8543621	.9921514
age	1.017826	0.240	.9882911	1.048244
kindergarten	1.832685	0.281	.6091436	5.51386
first	.9589421	0.940	.3237476	2.840392
second	1.086504	0.861	.4294395	2.748911
third	.8233118	0.567	.4228174	1.603156
fourth	1.130977	0.720	.5769563	2.216993
fifth	1.876669	0.086 *	.9153609	3.84754
sixth	1.066767	0.850	.5449235	2.08835
seventh	.7715468	0.465	.3849215	1.546509
eighth	1.018208	0.960	.4995487	2.075368
ninth	.7817432	0.502	.380944	1.604232
tenth	.6980824	0.327	.3402564	1.432211
eleventh	2.445286	0.097 *	.8509554	7.02672
twelfth	.9080131	0.853	.3263265	2.526573
business	1.392368	0.665	.3105959	6.241836
english	.7381306	0.279	.4261118	1.278624
famsci	1.245487	0.800	.2285531	6.787204
finearts	1.074121	0.898	.3586602	3.216792
math	.4092697	0.002 ***	.2330945	.7185998
physed	.2970568	0.012 **	.1146368	.7697591
science	1.805384	0.032 **	1.053052	3.095205
socstudies	1.152698	0.629	.6478887	2.050833
sped	.8988854	0.724	.4975972	1.623793
tech	1.872533	0.063 *	.9656276	3.631192
language	1.474682	0.608	.334558	6.500183
library	3.300903	0.183	.5692093	19.14227
health	2.107555	0.268	.5638851	7.877119
otherjob	.7473736	0.462	.3437281	1.625027
greenschool	1.095481	0.080 *	.9892196	1.213156
female	.8633324	0.585	.509146	1.463908
urban	1.067715	0.302	.9428625	1.2091
_Idrg_1	2.065089	0.229	.6334921	6.731878
_Idrg_2	1.006851	0.989	.3947224	2.568259
_Idrg_3	.7453902	0.563	.2756894	2.015336
_Idrg_4	1.248299	0.666	.4567269	3.41178
_Idrg_6	.921067	0.872	.3378515	2.511057
_Idrg_7	.9872741	0.983	.3128166	3.115916
_Idrg_8	1.893756	0.305	.5584851	6.4215
_Idrg_9	.7575333	0.776	.1114511	5.148955
exp_otherjob	1.042085	0.058 *	.9985393	1.087529
yes_envmem~r	1.286068	0.338	.7685203	2.15215

[11] *** p < .01, ** p < .05, * p < .10

Table 8. Regression Results for Effort to Teach

	Odds Ratio	P>z [12]	95% Confidence Interval	
plt	.4518939	0.158	.149946	1.361877
experience	.9240204	0.070 *	.8484037	1.006377
age	1.013836	0.420	.9805702	1.048231
kindergarten	1.022616	0.971	.3001009	3.484637
first	.8650955	0.813	.2607746	2.869874
second	1.440771	0.516	.478221	4.340716
third	1.094209	0.823	.4976482	2.405903
fourth	1.227934	0.607	.5619898	2.683008
fifth	1.623227	0.228	.7380607	3.569987
sixth	1.969481	0.078 *	.9272803	4.183046
seventh	.641438	0.245	.3034852	1.355726
eighth	1.26145	0.551	.587875	2.706793
ninth	.9692018	0.940	.4317741	2.175564
tenth	.7921684	0.571	.3541086	1.772142
eleventh	1.001597	0.998	.2991333	3.353679
twelfth	2.856213	0.085 *	.8667555	9.412058
business	4.78991	0.058 *	.9463105	24.24494
english	.6959598	0.252	.3742216	1.294313
famsci	.7104082	0.689	.1328429	3.799071
finearts	1.141223	0.835	.3282792	3.967327
math	.534583	0.048 **	.2872592	.9948474
physed	.6688428	0.509	.2028574	2.205247
science	2.37745	0.005 ***	1.300978	4.344628
socstudies	1.740708	0.102	.895593	3.383305
sped	.845473	0.643	.4159978	1.718337
tech	.7765379	0.491	.3778519	1.595893
language	4.825858	0.041 **	1.064932	21.86892
library	.9834464	0.987	.1253227	7.717409
health	.8120713	0.784	.1827887	3.607771
otherjob	.6288744	0.294	.2644636	1.495416
greenschool	1.09237	0.129	.9745134	1.224479
female	.6651603	0.167	.3729241	1.186403
urban	1.032027	0.640	.9042919	1.177805
_Idrg_1	1.25295	0.733	.3430919	4.575693
_Idrg_2	.9442708	0.914	.332234	2.683793
_Idrg_3	.5184618	0.240	.173135	1.552561
_Idrg_4	.8230536	0.741	.2598554	2.606901
_Idrg_6	1.454391	0.530	.4523657	4.675981
_Idrg_7	.8699671	0.834	.2366602	3.198014
_Idrg_8	.9391917	0.927	.2475505	3.563236
_Idrg_9	.8443235	0.872	.1084332	6.574391
exp_otherjob	1.04928	0.056 *	.9987074	1.102414
yes_envmem~r	1.79421	0.050 **	1.000901	3.21629

[12] *** p < .01, ** p < .05, * p < .10

Table 9. Regression Results for Student Engagement

	Odds Ratio	P > z [13]	95% Confidence Interval	
plt	.7433517	0.567	.2694816	2.050499
experience	.9394427	0.199	.8541009	1.033312
age	1.018391	0.331	.9816818	1.056472
kindergarten	.6013609	0.421	.174432	2.073215
first	3.076347	0.066 *	.9269052	10.21022
second	.4890456	0.198	.1646273	1.452769
third	.8025891	0.604	.3492654	1.844297
fourth	.8684115	0.727	.3938567	1.914754
fifth	1.256726	0.598	.5378663	2.936344
sixth	1.763455	0.221	.7112136	4.372491
seventh	1.306619	0.564	.5266123	3.241955
eighth	.5857936	0.239	.2404758	1.42698
ninth	.7515638	0.533	.3060472	1.845624
tenth	.6671379	0.377	.2719297	1.636721
eleventh	.6237316	0.470	.1732352	2.245739
twelfth	2.995766	0.084	.8618704	10.41295
business	.3088613	0.342	.0273163	3.492247
English	.6775127	0.314	.3176513	1.445055
famsci	2.395073	0.360	.3692938	15.53336
finearts	3.073695	0.139	.6943788	13.60584
math	.8926373	0.796	.3766429	2.115535
physed	7.487792	0.020	1.378647	40.66815
science	701325	0.297	.3599075	1.36662
socstudies	.6989167	0.379	.3144032	1.553688
sped	1.182903	0.682	.5293938	2.643136
tech	1.756297	0.132	.8439401	3.654976
language	.3351326	0.209	.0608938	1.844424
library	.6662621	0.708	.0796515	5.57309
health	1.151748	0.875	.1984409	6.684725
otherjob	.9063064	0.841	.3460843	2.373385
greenschool	.9766732	0.718	.8591183	1.110313
female	.6892276	0.263	.3589661	1.323341
urban	1.223953	0.012**	1.044574	1.434136
_Idrg_1	3.081728	0.120	.7456672	12.73631
_Idrg_2	4.742102	0.009***	1.468428	15.31401
_Idrg_3	1.427214	0.550	.4442299	4.585328
_Idrg_4	4.641484	0.016	1.330048	16.19744
_Idrg_6	1.273119	0.703	.3677571	4.40734
_Idrg_7	3.750832	0.088	.8225112	17.10462
_Idrg_8	2.000738	0.360	.4525196	8.845919
_Idrg_9	.516503	0.527	.0665588	4.008116
exp_otherjob	1.021082	0.434	.9690925	1.07586
yes_envmem~r.5992396	.5992396	0.102	.3244448	1.106777

[13] *** p < .01, ** p < .05, * p < .10

Project Learning Tree Workshops & Curricular Materials:

In the treatment survey, Project Learning Tree educators were asked a series of questions about their experiences with the PLT workshop and educational materials. Responses will help inform planning for future PLT educator workshops.

Table 10 shows the distribution of responses to the survey question: "Please rate the following Project Learning Tree curriculum guides according to frequency of use within your classroom." In order to understand the relative frequency of use for each PLT curriculum guide, a scoring system was established. Curriculum guides received 4 points for each response of "frequently used", 3 points for each "somewhat frequently used" responses, 2 points for each "neutral" response, and 1 point for each "infrequently used" response. The PreK-8 Environmental Education Activity Guide had by far the highest frequency of use, with a score of 72 points. With the exception of Energy & Society, the remaining curriculum guides scored between 44 and 47 points each. Energy & Society had the lowest frequency of use with a score of 26 points.

It seems likely that that the PreK-8 Environmental Education Activity Guide was used most frequently because it was written for such a wide range of ages. Although the Energy & Society curriculum guide was also designed for preK-8 students, its conceptual emphasis is much more focused, making it difficult for teachers to integrate lessons into standard curricula. The limited number of respondents in the treatment group may have influenced the lower frequencies of use reported for Places We Live and Focus on Forests. These two curriculum guides were designed specifically for students in grades 9-12 and there is little representation of high school teachers within the treatment group.

Table 10. Frequency of Use of PLT Curriculum Guides

	Frequently used	Somewhat frequently used	Neutral	Infrequently used	Never used	Score[14]
Environmental Experiences for Early Childhood	2 *(5.9%)*	7 *(20.6%)*	6 *(17.6%)*	3 *(8.8%)*	12 *(35.3%)*	**44**
PreK-8 Environmental Education Activity Guide	2 *(5.9%)*	14 *(41.2%)*	8 *(23.5%)*	6 *(17.6%)*	3 *(8.8%)*	**72**
Energy & Society	0 *(0%)*	4 *(11.8%)*	5 *(23.5%)*	4 *(11.8%)*	14 *(41.2%)*	**26**
Places We Live	0 *(0%)*	10 *(29.4%)*	6 *(17.6%)*	5 *(23.5%)*	9 *(26.5%)*	**47**
Focus on Forests	1 *(2.9%)*	8 *(23.5%)*	8 *(23.5%)*	3 *(8.8%)*	11 *(32.4%)*	**47**

[14] All activity guides were not ranked by the same number of treatment group respondents because some respondents opted not to rank a particular guide or set of guides. This can be seen in Table 10 where the percentage of respondents for a given number doesn't always match across guides.

It is useful to understand what motivates educators to seek training in environmental education so that workshops can be better tailored to participants' interests, needs and priorities. In order to gauge participants' initial motivations for attending a PLT educator workshop, survey respondents were provided with a list of potential motivating factors and were asked to check all that applied.

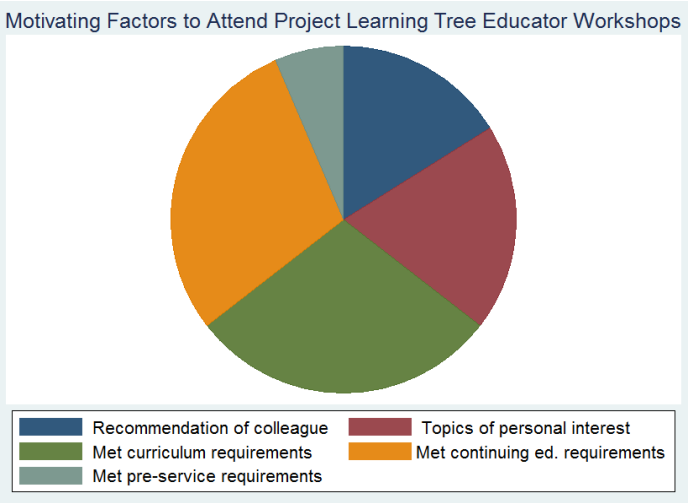

Figure 5. Motivating Factors for Workshop Participants

38.2% of PLT educators indicated that they were first motivated to participate in a workshop because it fulfilled continuing education requirements. 35.3% attended the PLT educator workshop because the topics covered were of personal interest. 29.4% attended on the recommendation of a colleague. Gaining assistance in meeting curricular goals motivated 26.5% of educators while only 5.9% attended to fulfill pre-service requirements.

The activities in Table 11 were listed in response to a question asking educators which specific activities they used most frequently in their classrooms. Only "Trees as Habitats" was mentioned by more than one educator. There were also numerous educators who indicated that they were uncertain of the exact names of activities or had developed original lessons using the PLT activities as inspiration.

Table 11. PLT Activities Referenced by Survey Respondents

The Global Climate	Poet-Tree
Energy Sleuths	Tree Cookies
A Look at Aluminum	Forest of S.T. Shrew
Adopt-a-Tree	We All Need Trees
Leaf Rubs	Fallen Log
Choose an Environment	Nature's Recyclers
Holding Power	Reduce, Reuse, Recycle
Did You Ever Eat	Personal Places
Pine Tree	Trees in Trouble
The Native Way	Sounds Around
Natural Lifestyle	Trees for Many Reasons
Growth Graph	What's in Soil
Improve School Site	Trees as Habitats (x2)
The Shape of Things	

In addition to the text of the activities themselves, PLT curriculum guides contain a number of other features designed to help educators use the activities as effectively as possible. An index is provided to help educators find activities relevant to specific topics quickly and efficiently. Appendices are used to catalogue supplementary information for more complicated activities. Each activity begins with a section of background information intended to help educators familiarize themselves with the concepts necessary for successful completion of the activity. Differentiated instruction techniques are recommended to make lessons more accessible to a wider range of students and may include techniques such as paired and cooperative learning, nonlinguistic representations, and higher order thinking (Stallard 2010). Appropriate assessment tools are suggested for each activity so that educators can gauge their students' progress and grasp of learning outcomes. Each activity concludes with a list of reading connections which recommend additional readings to be completed in association with the lesson. These readings may include folktales, myths, legends, poetry, chants, songs, maps or charts.

Treatment group respondents were asked to rate the helpfulness of each component of the PLT curriculum guides. This information will help workshop facilitators understand which resources are most valued by educators and which might require additional explanation. A point-based scoring system was used to understand the relative helpfulness of each resource. 4 points were awarded for each "very helpful" response, 3 for each "somewhat helpful" responses, and 2 points were awarded for neutral responses. No respondents selected "somewhat helpful" for any of the resources so this category was not used in scoring. No points were awarded for responses of "not helpful at all" or "I've never used this resource." The "Background Information" section received the highest score of 100 points. Most of the other resources had scores closely clustered around the mean of 86 points. Table 12 displays the distribution of responses for each resource.

Educators were also asked to indicate their level of agreement with a number of statements representing the key learning objectives of the workshops. Table 13 lists the full statements and the distribution of responses for each. The majority of respondents either "strongly agreed" or "agreed" that they had accomplished each objective and there were no objectives that respondents strongly disagreed they had achieved. These are both positive indications that workshops are successfully transferring knowledge on how to integrate environmental education in the classroom.

Table 12. Educator-Reported Helpfulness of PLT Resources

	Very Helpful	Somewhat Helpful	Neutral	Somewhat Unhelpful	Not helpful at all	I've never used this resource	Score[15]
Appendices	17 *(58.6%)*	5 *(17.2%)*	3 *(10.3%)*	0 *(0%)*	2 *(6.9%)*	2 *(6.9%)*	**89**
Indices	15 *(51.7%)*	7 *(24.1%)*	3 *(10.3%)*	0 *(0%)*	2 *(6.9%)*	2 *(6.9%)*	**87**
Technology Connections	9 *(31.0%)*	9 *(31.0%)*	7 *(24.1%)*	0 *(0%)*	2 *(6.9%)*	2 *(6.9%)*	**77**
Differentiated Instruction	13 *(40.6%)*	8 *(25.0%)*	7 *(21.9%)*	0 *(0%)*	2 *(6.3%)*	2 *(6.3%)*	**90**
Reading Connections	12 *(40.0%)*	11 *(36.7%)*	3 *(10.0%)*	0 *(0%)*	2 *(6.7%)*	2 *(6.7%)*	**87**
Background Information	20 *(64.5%)*	6 *(19.4%)*	1 *(3.2%)*	0 *(0%)*	2 *(6.5%)*	2 *(6.5%)*	**100**
Assessment Opportunities	7 *(24.1%)*	9 *(31.0%)*	9 *(31.0%)*	0 *(0%)*	2 *(6.9%)*	2 *(6.9%)*	**73**

Table 13. Participant Response to Workshop Objectives

	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree
Increased my knowledge of how to integrate environmental education in my classroom	11 *(32.4%)*	19 *(55.9%)*	3 *(8.8%)*	1 *(2.9%)*	0 *(0%)*
Reduced the amount of time it takes to prepare for an environmental education lesson	5 *(14.7%)*	18 *(52.9%)*	8 *(23.5%)*	3 *(8.8%)*	0 *(0%)*
Helps me meet curriculum requirements through environmental education lessons	6 *(17.7%)*	18 *(52.9%)*	8 *(23.5%)*	2 *(5.9%)*	0 *(0%)*

The final section of the treatment and control group surveys asked questions intended to help with planning the logistics of future workshops. The first in this set of questions asked educators: "Imagine that training opportunities for subjects of interest to you were available online so that you could work through them on your own time. If you were given equal compensation for each, would you be more likely to participate in online trainings than

[15] Similar to Table 10, all features were not ranked by the same number of treatment group respondents so the percentage of respondents for a given number doesn't always match across features.

opportunities offered in person?" The majority of respondents (~54%) indicated that they would be more likely to participate in online trainings while the remaining respondents were fairly evenly split between "No" (20.4%) and "Unsure" (25.6%). The most common reasons cited for being unsure or unwilling to participate in online trainings were preferring in-person, interactive training, having no prior experience with online trainings, having had poor experiences with online trainings, needing a set schedule to ensure that the training was completed, and having too many other time commitments.

The final questions asked educators to indicate the days of the week and months of the year that would be most convenient for attending professional development opportunities. Educators were asked to rank their top three choices for each question. A scoring system was again used to understand which days and months were most conducive to scheduling professional development trainings. 3 points were assigned for each first choice rating, 2 points for each second choice rating, and 1 point for each third choice rating. Tuesday was considered the most convenient day for professional development trainings, followed closely by Monday and Wednesday respectively. Sunday received the lowest rating for convenience. The full ratings for days of the week can be found in Table 14. October, April, and March were considered the most convenient months of the year for professional development and December received by far the lowest rating. The full ratings for months of the year can be found in Table 15.

Table 14. Ranking of Days of Week for Professional Development Opportunities

	First Choice	Second Choice	Third Choice	Score
Monday	121	42	43	490
Tuesday	84	110	42	514
Wednesday	37	95	122	423
Thursday	36	74	105	361
Friday	58	43	42	302
Saturday	67	7	17	232
Sunday	2	30	4	80

Table 15. Ranking of Months of the Year for Professional Development Opportunities

	First Choice	Second Choice	Third Choice	Score
January	45	13	26	187
February	24	50	22	194
March	45	36	58	265
April	45	57	45	294
May	21	59	57	238
June	33	12	61	184
July	51	30	8	221
August	19	49	30	185
September	34	12	14	140
October	64	45	39	321
November	21	40	31	174
December	6	6	10	40

Discussion and Recommendations:

This program evaluation was completed in order to inform the future evolution of Project Learning Tree in Connecticut. The results of the evaluation currently indicate that participation in a Project Learning Tree educator workshop is not a significant predictor of the frequency of environmental education in Connecticut classrooms. In light of this result and respondents' evaluations of the workshops, the following recommendations should increase the accessibility of Project Learning Tree workshops to Connecticut educators and ensure that participants put their training into action.

1. Foster meaningful, lasting relationships with trainees.

In order to maximize the value of the Project Learning Tree workshops and encourage educators to put their training into action, it is important for educators to feel that they are part of a greater community, all working towards the same challenge of integrating environmental education into standard school curricula. There were several indicators during the survey research process which suggested that Project Learning Tree trainees aren't connecting with their experience as fully as possible. The low survey response rate indicates that either trainees aren't reading communications from Connecticut Project Learning Tree or don't feel invested enough to take time to complete the survey. There were no records of participants prior to 2004 and contact information since has never been updated or fully filed in an easily accessible format. Not only is an educator's investment in Project Learning Tree necessary to ensure that the training will be utilized in the classroom but nearly a third of trainees indicated that they attended a Project Learning Tree workshop on the recommendation of a colleague. Maintaining mutually beneficial relationships with Project Learning Tree participants should be a priority for the program's future growth in Connecticut.

Although Project Learning Tree educators aren't technically volunteers, they function similarly day-to-day. The educators aren't obligated to incorporate environmental education into their classrooms but may choose to do so voluntarily. There is an extensive literature detailing strategies for volunteer recruitment, management, and retention. These strategies have important implications for structuring future Project Learning Tree workshops and building continued relationships with participants. McCurley and Lynch (1994) report that "the key to retaining volunteers is to meet the personal motivational needs of each." In future Project Learning Tree workshops, it may be useful to dedicate time to understanding what each educator hopes to gain from the workshop and how that experience could be best facilitated. Sharing personal motivations and interests as a group could help educators facing similar challenges connect and build relationships which could be continued into the future. Understanding what brought each individual to the workshop will also inform how best to follow up with participants after the completion of the day.

Within the volunteer management literature, there are repeated mentions of the importance of public and private recognition of volunteers' efforts. Connecticut Project Learning Tree currently names a Connecticut Project Learning Tree Educator of the Year which is an excellent example of one model for demonstrating appreciation. This educator is featured on The Connecticut Forest & Park Association's website and in a Connecticut Project Learning Tree

newsletter. In addition to providing this type of formal recognition, many studies also cite the importance of making more frequent but less formal contact with volunteers, particularly at times that they might not expect it. Examples of this kind of contact could include sending thank you letters throughout the school year to recognize the dedication it requires to engage with the challenge of increasing environmental education in Connecticut classrooms. Other authors cite examples of organizations who collect birthdays on their workshop registration forms and send birthday cards to volunteers throughout the year (Casison 2002).

A final theme worth noting from the volunteer management literature is the importance of building support networks between the volunteers themselves (Britton 1999). PLT participants may recognize CFPA and CT DEEP as resources but it is unclear whether or not participants recognize each other as accessible resources. It may be useful to develop a mechanism through which PLT educators can communicate into the future, whether it be virtually or in-person. Listservs or online message boards could help facilitate the sharing of challenges, solutions, and success stories which will inspire educators to continually reflect on their progress.

2. Tailor workshops to continuing education requirements.

38.2% of PLT educators indicated that they were first motivated to participate in a PLT educator workshop because it fulfilled continuing education requirements. Convincing school systems to pay for substitute teachers can be challenging and aligning workshops with continuing education requirements gives educators a strong justification for the expense. To maximize the number of educators able to participate in a workshop, particularly those from disciplines other than science, Project Learning Tree needs to better advertise the alignment of workshop content and Connecticut continuing education requirements.

3. Emphasize integration with Connecticut state curriculum frameworks.

Project Learning Tree materials are specifically designed to work hand-in-hand with state curriculum frameworks and this feature needs to be better emphasized in the educator workshops. Only 60.6% of PLT educators were aware that the PreK-8 Environmental Education Activity Guide, Energy & Society guide, and Places We Live guide were correlated to the Connecticut Curriculum Framework. With most educators citing time constraints as the primary obstacle to using more of their training, it will be important in the future to make sure that educators are aware of and prepared to use the connections to the Connecticut Curriculum Framework. This could be accomplished by allowing more time to practice environmental lesson planning during the PLT workshop or by maintaining an online forum or listserv where educators can post examples of lessons they've used in conjunction with the Connecticut Curriculum Framework.

4. Target educators outside of science disciplines.

Connecticut Project Learning Tree needs to improve its outreach to non-science educators in school systems that aren't taking the first steps towards sustainability. The results from this study show that science educators and educators working in schools with strong sustainability practices are already the most likely to be teaching environmental education, even in the absence

of training. Therefore, the most gains can be had from working with teachers in other disciplines and districts.

In many disciplines, there is a strong perception that there is either not enough time to incorporate environmental education lessons or that environmental education is not applicable to the subject matter. Table 16 shows the break-down of survey responses to the question of whether or not educators felt they had enough time to teach environmental education within their standard curricula. The largest response category for all subjects except for science was "not applicable", meaning that educators in these disciplines felt that environmental education wasn't relevant to their lessons. Additionally, 19.3% of English teachers, 26.5% of math teachers, and 16.1% of social studies teachers felt that there wasn't enough time to incorporate environmental education into their lessons, even if there was relevant overlap in the material. Ensuring that educators are well-versed in the correlations to the Connecticut Curriculum Framework could help participants overcome the obstacle of time and integrate environmental education more easily and efficiently.

Table 16. Distribution of Responses: "In light of curriculum requirements, do you feel that you have enough time to incorporate environmental education activities into the following subject areas?"

	Yes	No	Unsure	Not Applicable
Business	26 *(8.8%)*	14 *(4.7%)*	28 *(9.5%)*	228 *(77.0%)*
English/Language Arts	115 *(35.2%)*	63 *(19.3%)*	39 *(11.9%)*	110 *(33.6%)*
Family & Consumer Sciences	41 *(14.0%)*	14 *(4.8%)*	24 *(8.2%)*	214 *(73.04%)*
Fine Arts	53 *(18.0%)*	19 *(6.5%)*	20 *(6.8%)*	202 *(68.7%)*
Mathematics	63 *(19.6%)*	85 *(26.5%)*	55 *(17.1%)*	118 *(36.8%)*
Physical Education	29 *(9.8%)*	20 *(6.7%)*	33 *(11.1%)*	215 *(72.4%)*
Science	164 *(49.1%)*	38 *(11.4%)*	20 *(6.0%)*	112 *(33.5%)*
Social Studies/History	104 *(32.9%)*	51 *(16.1%)*	25 *(7.9%)*	136 *(43.0%)*
Special Education	63 *(20.7%)*	36 *(11.8%)*	30 *(9.8%)*	176 *(57.7%)*
Technology	77 *(25.5%)*	29 *(9.6%)*	41 *(13.6%)*	155 *(51.3%)*

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Acknowledgments

This Masters' Project would not have been possible without the support and guidance of numerous individuals. I would like to thank Lori Brant (Connecticut Forest & Park Association) and Rachael Sunny (Connecticut Department of Energy & Environmental Protection) for helping me to envision and structure this project. I would like to extend my thanks to the entire Connecticut Project Learning Tree Steering Committee for entrusting me with this endeavor and providing valuable feedback throughout the process. I would also like to thank Dr. Randy Kramer for his assistance in developing my survey instrument and my advisor, Dr. Lori Bennear, for introducing me to the methods of program evaluation and coaching me throughout. Partial funding for this research was provided by the Doris Duke Charitable Foundation through the Doris Duke Conservation Fellowship program.

Appendix A:

List of Participating Schools and School Districts

School Name	District
John G. Pendergast School	Ansonia
Mary R. Tisko Elementary School	Branford
Whisconier Middle School	Brookfield
The Morgan School	Clinton
Nathan Hale Middle School	Coventry
Cromwell High School	Cromwell
Woodside Intermediate School	Cromwell
Middlesex Middle School	Darien
Anna Norris Elementary School	East Hartford
Farmington High School	Farmington
Helen Street School	Hamden
Gallup Hill School	Ledyard
High School in the Community	New Haven
Totoket Valley Elementary School	North Branford
Old Saybrook Middle School	Old Saybrook
Bethany Middle School	Region 5
Lewis Mills High School	Region 10
Shepaug Valley High School	Region 12
Henry James Memorial School	Simsbury
Mabelle Avery Middle School	Somers
Eli Tery Elementary School	South Windsor
Orchard Hill Elementary School	South Windsor
Philip R. Smith Elementary School	South Windsor
Pleasant Valley Elementary School	South Windsor
Wapping Elementary School	South Windsor
Timothy Edwards Middle School	South Windsor
South Windsor High School	South Windsor
Stafford Elementary School	Stafford
Stafford High School	Stafford
Stafford Middle School	Stafford
Staffordville School	Stafford
Stonington High School	Stonington
Birch Grove Elementary School	Tolland
Tolland Intermediate School	Tolland
Union School	Union
Rockville High School	Vernon
West Haven High School	West Haven

Appendix B:
Treatment Group Survey

PROJECT LEARNING TREE EDUCATOR SURVEY:

1. How many years of teaching experience do you currently have? : _____

2. Please enter your current age, in years: _____

3. With which gender do you identify?

- ❍ Male
- ❍ Female
- ❍ Prefer not to answer

4. Which school district does your school belong to? : _____

5. Which of the following best describes your school?

- ❍ Public School
- ❍ Public Magnet School
- ❍ Private School- Parochial
- ❍ Private School- Nonparochial
- ❍ Charter School
- ❍ Other, please specify: _____

6. What grade level do you teach? Please check all that apply.

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

7. Which of the following subjects do you teach? Please check all that apply.

- ❑ Business/Marketing/Finance
- ❑ English/Language Arts
- ❑ Environmental Science
- ❑ Family/Consumer Sciences
- ❑ Fine Arts
- ❑ Mathematics
- ❑ Physical Education
- ❑ Science
- ❑ Social Studies/History
- ❑ Special Education
- ❑ Technology
- ❑ World Language
- ❑ Other, please specify: _____

8. Did you have another occupation prior to teaching? If "No", please skip to question 10.

- ❍ Yes
- ❍ No

9. In which of the following fields were you employed prior to teaching? Please check all that apply.

- ❑ Health care and social assistance
- ❑ Arts, entertainment, and recreation
- ❑ Educational services
- ❑ Professional, scientific, and technical services
- ❑ Manufacturing
- ❑ Wholesale trade
- ❑ Retail trade
- ❑ Information
- ❑ Finance and insurance
- ❑ Accommodation and food services
- ❑ Transportation and warehousing
- ❑ Real estate and rental and leasing
- ❑ Management of companies and enterprises
- ❑ Waste management and remediation services
- ❑ Administrative support
- ❑ Mining
- ❑ Utilities
- ❑ Construction

10. What initially motivated you to participate in a Project Learning Tree educator workshop? Please check all that apply.

- ❑ Recommendation of colleague
- ❑ Topics were of personal interest
- ❑ Met curricular goals/standards
- ❑ Fulfilled continuing education requirements
- ❑ Fulfilled pre-service education requirements
- ❑ Other, please specify: _____

11. Please rate the following Project Learning Tree curriculum guides according to frequency of use within your classroom.

	Frequently used	Somewhat frequently used	Neutral	Infrequently used	Never used
Environmental Experiences for Early Childhood	❍	❍	❍	❍	❍
PreK-8 Environmental Education Activity Guide	❍	❍	❍	❍	❍
Energy & Society	❍	❍	❍	❍	❍
Places We Live	❍	❍	❍	❍	❍
Focus on Forests	❍	❍	❍	❍	❍
Other, please specify:	❍	❍	❍	❍	❍

12. Please provide the names of specific Project Learning Tree activities, from any of the curriculum guides, that you use most frequently:

_____

_____

_____

_____

_____

13. Please rate the helpfulness of the resources within the Project Learning Tree curriculum guides.

	Very helpful	Somewhat helpful	Neutral	Somewhat unhelpful	Not helpful at all	I've never used this resource
Appendices	❍	❍	❍	❍	❍	❍
Indices	❍	❍	❍	❍	❍	❍
Technology Connections	❍	❍	❍	❍	❍	❍
Differentiated Instruction	❍	❍	❍	❍	❍	❍
Reading Connections	❍	❍	❍	❍	❍	❍
Background Information	❍	❍	❍	❍	❍	❍
Assessment Opportunities	❍	❍	❍	❍	❍	❍

14. In your classroom, do you use Project Learning Tree activities:

- ❍ Learned in your Project Learning Tree educator workshop?
- ❍ Discovered by exploring the curriculum guides after the workshop?
- ❍ Both?
- ❍ Neither?
- ❍ Other, please specify: _____

15. Please indicate your level of agreement with the following statements. The Project Learning Tree educator workshop...

	Strongly agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree
Increased my knowledge of how to integrate environmental education in my classroom	❍	❍	❍	❍	❍
Reduced the amount of time it takes to prepare for an environmental education lesson	❍	❍	❍	❍	❍
Helps meet curriculum requirements through env. education lessons	❍	❍	❍	❍	❍

16. Are you aware that the PreK-8 Activity Guide, Energy & Society guide, and Places We Live guide were correlated to the Connecticut Curriculum Framework?

❍ Yes
❍ No

17. Do you utilize the Correlations to the Connecticut Curriculum Framework? If "Yes", please skip to question 19.

❍ Yes
❍ No

18. You indicated that you do not use the Correlations to the Connecticut Curriculum Framework. Please elaborate on why you do not use this resource.

_____
_____
_____
_____
_____

For the purposes of this survey, environmental education is defined as:
Education aimed at producing citizens who are knowledgeable about the environment, appreciate the natural world, and are motivated to investigate and take action towards solutions for environmental problems (Stapp 1969).

Environmental education is not limited to science lessons. The following are all examples of environmental education:

- Reading and discussing nature writing
- Listening to and discussing music inspired by the natural world
- Studying environmental movements historically
- Working on art projects with natural materials or inspired by the natural world

19. On average, how many times per month do you teach an environmental education lesson in your classroom? : _____

20. How confident do you feel in your ability to integrate environmental education activities into your classroom?

❍ Very confident
❍ Somewhat confident
❍ Neutral
❍ Somewhat unconfident
❍ Not at all confident

21. Compared to your preparation for other lessons, how much effort do you feel that it takes to prepare and to teach an environmental education lesson?

	Much more effort	Somewhat more effort	Same amount of effort	Somewhat less effort	Much less effort
To prepare	❍	❍	❍	❍	❍
To teach	❍	❍	❍	❍	❍

22. How does your students' level of participation and engagement in environmental education activities compare to their level of participation and engagement in other lessons?

- ❍ Much higher level of engagement
- ❍ Somewhat higher level of engagement
- ❍ The same level of engagement
- ❍ Somewhat less engagement
- ❍ Much less engagement

23. In light of curriculum requirements, do you feel that you have enough time to incorporate environmental education activities into the following subject areas?

	Yes	No	Unsure	Not Applicable
Business/Marketing/Finance	❍	❍	❍	❍
English/Language Arts	❍	❍	❍	❍
Environmental Science	❍	❍	❍	❍
Family/Consumer Sciences	❍	❍	❍	❍
Fine Arts	❍	❍	❍	❍
Mathematics	❍	❍	❍	❍
Physical Education	❍	❍	❍	❍
Science	❍	❍	❍	❍
Social Studies/History	❍	❍	❍	❍
Special Education	❍	❍	❍	❍
Technology	❍	❍	❍	❍
World Language	❍	❍	❍	❍
Other, please specify	❍	❍	❍	❍

24. Are you a member of any environmental or conservation organizations?

- ❍ No
- ❍ Yes, please specify: _____

25. Which of the following programs or practices does your school currently have in place? Please check all that apply.

- ❑ School garden
- ❑ Nature trail
- ❑ Recycling of paper and plastic
- ❑ Recycling of electronic wastes
- ❑ Use of energy efficient lighting
- ❑ Encourage walking/biking to school
- ❑ Student "Green Team"
- ❑ Staff/Faculty "Green Team"
- ❑ Outdoor classroom
- ❑ Composting for food waste
- ❑ Earth Day celebrations
- ❑ Serve local food in the cafeteria
- ❑ Display an environmental policy/mission statement
- ❑ Encourage double-sided copying

26. Imagine that training opportunities for subjects of interest to you were available online so that you could work through them on your own time. If you were given equal compensation for each, would you be more likely to participate in online trainings than opportunities offered in person? If "yes", please skip to question 28.

- ❍ Yes
- ❍ No
- ❍ Unsure

27. You indicated either that you would not be interested in participating in online trainings or were unsure. Please elaborate on why you feel this way.

_____

28. Given your schedule, which days of the week are most convenient for you to attend professional development opportunities? Please rank up to your top three choices with 1 indicating your top choice, 2 your second choice, and 3 your last choice.

___ Sunday

___ Monday

___ Tuesday

___ Wednesday

___ Thursday

___ Friday

___ Saturday

29. Given your schedule, which months of the year are most convenient for you to attend professional development opportunities? Please rank up to your top three choices with 1 indicating your top choice, 2 your second choice, and 3 your last choice.

___ January

___ February

___ March

___ April

___ May

___ June

___ July

___ August

___ September

___ October

___ November

___ December

30. Is there anything that you would like to share with me about your experiences with environmental education generally or Project Learning Tree specifically?

_____

_____

_____

_____

_____

Thanks for taking the time to complete this survey- your input is greatly appreciated! If you would like to enter the drawing for a $50 Visa gift card or a set of Connecticut Walk Books (complete set of maps and trail guides for the Connecticut blue-blazed hiking trail system, a $50 value), please send an email to jennifer.sayers@duke.edu, with " PLT Drawing entry" as the subject line, and your preferred contact information in the body of the email. Sending an email external to this survey will ensure that your contact information is not linked to your survey responses in any way.

Appendix C:

Survey Data Code Sheet

DEMOGRAPHICS

experience: Years of teaching experience
age: Current age
gender: Gender
1: Male
2: Female
3: Prefer not to answer
district: School district
1: Ansonia
3: Bridgeport
4: Branford
5: Brookfield
6: Clinton
7: Coventry
8: Cromwell
9: Darien
10: Chaplin
11: East Hartford
12: Farmington
13: Hamden
14: Ledyard
15: Hartford
16: Fairfield
17: Manchester
18: New Haven
19: Norwich
20: Stratford
21: Waterbury
22: Weston
23: North Branford
24: Wethersfield
27: Old Saybrook
30: Danbury
31: Region 5
32: Bolton
33: Region 10
34: Colchester
35: Region 12
36: Killingly
37: Brooklyn
38: Cheshire
39: Canterbury

40: Ashford
45: Simsbury
46: Somers
47: South Windsor
48: Southington
49: Stafford
51: Stonington
54: Tolland
56: Union
57: Vernon
61: Middletown
62: West Haven

drg: District Reference Group

1: A	5: E	9: I
2: B	6: F	
3: C	7: G	
4: D	8: H	

gradelevel:

0: Kindergarten	6: 6th	12: 12th
1: 1st	7: 7th	
2: 2nd	8: 8th	
3: 3rd	9: 9th	
4: 4th	10: 10th	
5: 5th	11: 11th	

female: 1: female educator 0: male educator

urban:[16]

1: City, Large: Territory inside an urbanized area and inside a principal city with population of 250,000 or more.

2: City, Midsize: Territory inside an urbanized area and inside a principal city with population less than 250,000 and greater than or equal to 100,000.

3: City, Small: Territory inside an urbanized area and inside a principal city with population less than 100,000.

4: Suburb, Large: Territory outside a principal city and inside an urbanized area with population of 250,000 or more.

5: Suburb, Midsize: Territory outside a principal city and inside an urbanized area with population less than 250,000 and greater than or equal to 100,000.

[16] U.S. Department of Education, Urban-centric locale codes

6: Suburb, Small: Territory outside a principal city and inside an urbanized area with population less than 100,000.

7: Town, Fringe: Territory inside an urban cluster that is less than or equal to 10 miles from an urbanized area.

8: Town, Distant: Territory inside an urban cluster that is more than 10 miles and less than or equal to 35 miles from an urbanized area.

9: Town, Remote: Territory inside an urban cluster that is more than 35 miles of an urbanized area.

10: Rural, Fringe: Census-defined rural territory that is less than or equal to 5 miles from an urbanized area, as well as rural territory that is less than or equal to 2.5 miles from an urban cluster.

11: Rural, Distant: Census-defined rural territory that is more than 5 miles but less than or equal to 25 miles from an urbanized area, as well as rural territory that is more than 2.5 miles but less than or equal to 10 miles from an urban cluster.

12: Rural, Remote: Census-defined rural territory that is more than 25 miles from an urbanized area and is also more than 10 miles from an urban cluster.

GRADE LEVEL TAUGHT

kindergarten
first
second
third
fourth
fifth
sixth
seventh
eighth
ninth
tenth
eleventh
twelfth

SUBJECTS TAUGHT

business: Business/Marketing/Finance
english: English/Language Arts
famsci: Family/Consumer Sciences
finearts: Fine Arts
math: Mathematics
physed: Physical Education
science: Science
socstudies: Social Studies/History
sped: Special Education

tech: Technology
language: World Language
library: Library/Information Literacy
guidance: Guidance/School Counselor/School Psychologist
health: Health
othersubject: Subject other than above categories, incl: film study, school nurse, speech language pathologist, vocational education, industrial arts, character education, women's studies, sociology, public speaking, ELL, administration, agriculture

PRIOR OCCUPATIONS
(Categories taken from U.S. Census)

otherjob: 1: educator did not have a different job prior to teaching
2: educator did have a different job prior to teaching

social: Health care and social assistance
entertainment: Arts, entertainment, and recreation
education: Educational services
scientific: Professional, scientific, and technical services
manufacture: Manufacturing
trade: Wholesale trade
retail: Retail trade
information: Information
fininsurance: Finance and insurance
accomfood: Accommodation and food services
transportwarehouse: Transportation and warehousing
realestate: Real estate and rental and leasing
management: Management of companies and enterprises
waste: Waste management and remediation services
admin: Administrative support
mining: Mining
utilities: Utilities
construction: Construction

MOTIVATING FACTORS FOR WORKSHOP PARTICIPATION

recommendation: 1: Attended on recommendation of a colleague 0: otherwise
interest: 1: Topics covered were of person interest 0: otherwise
curriculum: 1: Topics were relevant to required curriculum 0: otherwise
continuinged: 1: Fulfilled continuing education requirements 0: otherwise
preservice: 1: Fulfilled pre-service education requirements 0: otherwise

PROJECT LEARNING TREE CURRICULUM GUIDES

The following variables are assigned Likert scale ratings according to the following scale:
1: Frequently used
2: Somewhat frequently used
3: Neutral
4: Infrequently used
5: Never used

earlychildhood: Environmental Experiences for Early Childhood
prek8: PreK-8 Environmental Education Activity Guide
energysociety: Energy & Society
placeswelive: Places We Live
forcusforests: Focus on Forests

FEATURES OF PROJECT LEARNING TREE CURRICULUM GUIDES

The following variables are assigned Likert scale ratings according to the following scale:
1: Very helpful
2: Somewhat helpful
3: Neutral
4: Somewhat unhelpful
5: Not helpful at all
6: I've never used this resource

appendices: Appendices
indices: Indices
techconnections: Technology Connections
diffinstruct: Differentiated Instruction
readingconnections: Reading Connections
background: Background Information
assessment: Assessment Opportunities

PROJECT LEARNING TREE WORKSHOP EVALUATION

activities: 1: Educator uses PLT activities learned in educator workshop.
2: Educator uses PLT activities discovered individually after the workshop.
3: Both
4: Neither

The following variables are assigned Likert scale ratings according to the following scale:
1: Strongly agree
2: Agree
3: Neither agree nor disagree
4: Disagree
5: Strongly disagree

knowledgeincrease: Workshop increased my knowledge of how to integrate environmental education in my classroom

timereduced: Workshop reduced the amount of time it takes to prepare for an environmental education lesson

meetcurriculum: Workshop helps me meet curriculum requirements through environmental education lessons

correlationaware: 1: Educator is aware of correlations to CT Curriculum Framework
2: Educator is not aware of correlations to CT Curriculum Framework

utilizecorrelations: 1: Educator is aware of and uses correlations to CT Curriculum Framework
2: Educator is aware of but doesn't use correlations to CT Curriculum Framework.

ENVIRONMENTAL EDUCATION

numlessons: Average number of environmental education lessons taught per month

confidence: Measure of confidence in integrating environmental education into classroom
1: Very confident
2: Somewhat confident
3: Neutral
4: Somewhat unconfident
5: Not at all confident

effort_prepare: Measure of amount of effort to prepare an environmental education lesson, as compared to preparation for other lessons

1: Much more effort
2: Somewhat more effort
3: Same amount of effort
4: Somewhat less effort
5: Much less effort

effort_teach: Measure of amount of effort to teach an environmental education lesson, as compared to preparation for other lessons

1: Much more effort
2: Somewhat more effort
3: Same amount of effort
4: Somewhat less effort
5: Much less effort

engagement: Measure of students' participation and engagement in environmental education lessons, as compared to other lessons

1: Much higher level of engagement
2: Somewhat higher level of engagement
3: The same level of engagement
4: Somewhat less engagement
5: Much less engagement

Does educator have enough time to incorporate environmental education in light of curriculum requirements?

1: Yes
2: No
3: Unsure
4: Not Applicable

time_business: Business/Marketing/Finance
time_english: English/Language Arts
time_envsci: Environmental Science
time_famsci: Family/Consumer Sciences
time_finearts: Fine Arts
time_math: Mathematics
time_physed: Physical Education
time_science: Science
time_socstudies: Social Studies/History
time_sped: Special Education
time_tech: Technology
time_language: World Language
time_library: Library/Information Literacy
time_guidnace: Guidance/School Counselor/School Psychologist
time_health: Health

MEASURES OF INTEREST/SUPPORT

yes_envmember: 0: Educator is not a member of an environmental or conservation organization
1: Educator is a member of an environmental or conservation organization
garden: School garden
trail: Nature trail
recycling: Recycling of paper and plastic
erecycling: Recycling of electronic wastes
lighting: Use of energy efficient lighting
walkbike: Encourage walking/biking to school
studentgreen: Student "Green Team"
staffgreen: Staff/Faculty "Green Team"
outdoorclass: Outdoor classroom
compost: Composting of food waste
earthday: Earth Day celebrations
localfood: Serve local food in the cafeteria
policy: Environmental policy/mission statement posted
copying: Double-sided copying

greenschool: Total number of above sustainability practices reported for educator's school

FUTURE TRAINING

online: Measure of interest in online trainings instead of in-person
1: Yes
2: No
3: Unsure

nointerest: Explanation of why people wouldn't be interested in online trainings
1: Prefer in-person, interactive training
2: Have no prior experience with online training; are uncomfortable with online training
3: Have had poor experiences with online trainings previously (i.e. technology issues, poor quality instruction)
4: Need a set schedule to ensure that training actually happens
5: Too many other time commitments

unsureinterest: Explanation of why people are unsure of interest in online trainings
1: Prefer in-person, interactive training
2: Have no prior experience with online training; are uncomfortable with online training
3: Have had poor experiences with online trainings previously (i.e. technology issues, poor quality instruction)
4: Need a set schedule to ensure that training actually happens
5: Too many other time commitments

For the following day/month variables, educators were asked to indicate their top three choices in terms of convenience for holding professional development training opportunities.

sunday
monday
tuesday
wednesday
thursday
friday
saturday

january
february
march
april
may
june
july
august
september
october
november
december