

Leave No Trace Education: A Case Study on the Educational Methods
Utilized by the Leave No Trace Center for Outdoor Ethics

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ABSTRACT

LEAVE NO TRACE EDUCATION: A CASE STUDY ON THE EDUCATIONAL METHODS UTILIZED BY THE LEAVE NO TRACE CENTER FOR OUTDOOR ETHICS

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Leave No Trace (LNT) is imperative in the field of outdoor recreation to protect natural spaces and preserve them for generations to come. Exposure to LNT is pivotal in the development of environmental stewardship in children and adults. The purpose of this study was to examine the educational methods utilized by the LNT Center for Outdoor Ethics to determine the best practices to cultivate and instill the principles of LNT. The research was conducted using a best practices instrument, developed by the researcher, to evaluate the attributes present in LNT educational methods by the LNT Center. This study found that LNT educational programs that are skills-based, location-, activity-, behavior-, context-, and age-specific are the most effective forms of LNT education. This study can function as a guide in developing effective frontcountry and backcountry LNT educational programs.

Keywords: Leave No Trace, Leave No Trace education, outdoor education, environmental stewardship, program attributes, andragogy

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Chapter 1

INTRODUCTION AND REVIEW OF LITERATURE

Background of Study

Throughout history, the concepts of the rights of nature have been taught in many cultures to ensure that natural spaces are preserved for generations to come. With increasing urbanization and industrialization across the United States, paired with capitalistic ideals that force maximum efficiency and productivity, less and less people spend time outdoors. Many people have not been exposed to outdoor ethics and responsible outdoor recreation. Many youths, especially those in urban areas, are disconnected from nature, “only spend[ing] about 15 to 25 min/day outdoors recreating” (Atchley et al., 2012, p. 1). When recreating in nature in national parks, forests, monuments, and other public lands, adults and youths alike, those without previous experience, have not had the appropriate exposure to common outdoor principles that avid outdoorspeople know by heart. This lack of awareness directly translates to the need for environmental education for youths and adults, whether that is incorporated in public school curriculum, or driven through onsite programs at natural spaces.

This lack of knowledge and general affinity for nature may result in damage to natural spaces from things such as pollution, fire, and disregard for the rights of nature. One solution to this problem is to increase the availability of and engagement in outdoor education. With an increase in outdoor education, those who choose to recreate outdoors will now have knowledge on their direct effects on the environment, along with resources on how to best preserve the places they love. Outdoor education has the potential to

change visitors' behaviors from those of ignorance and neglect of responsibility, to those of respect for nature and an awareness of interdependency. Leave No Trace principles serve as the standard for outdoor ethics and responsible outdoor recreation. They promote "stewardship using seven guiding principles: (a) plan ahead and prepare, (b) travel and camp on durable surfaces, (c) dispose of waste properly, (d) leave what you find, (e) minimize campfire impacts, (f) respect wildlife, and (g) be considerate of other visitors" (Backman et al., 2018, p. 1). The purpose of this study was to examine the educational methods utilized by the Leave No Trace Center for Outdoor Ethics to determine the best practices to cultivate and instill the principles of Leave No Trace.

Review of Literature

Research for this review of literature was conducted at Robert E. Kennedy Library on the campus of California Polytechnic State University, San Luis Obispo. In addition to books and other resources, the following online databases were utilized: Academic Search Premier, EBSCO, ABI/INFORM, Gale Academic OneFile, and Google Scholar. This review of literature includes the following subsections: andragogical approaches, field-based learning techniques, and Leave No Trace education.

Leave No Trace (LNT) is an essential concept for every human being to understand and utilize when recreating outdoors. LNT education in the United States is typically seen as general messaging that is posted at trailheads and high-impact locations in protected spaces, in addition to messaging on park publications. General LNT messaging is the display of the seven LNT principles, which will be detailed below. To understand how outdoor education has been absent from public discourse and how best

communities can incorporate it to increase environmental awareness, one must first dissect the approaches to andragogy current in practice and in research.

Andragogy has been at the center of human development and knowledge accumulation and progression for centuries. Andragogy is defined as “the art or science of teaching adults” (Merriam-Webster, 2021, p.1), focusing on the distinction between child and adult learning. The acquisition of knowledge, most often specialized, is a steppingstone to unlock one’s potential; to make a difference in the world and be a part of a functioning community. The most effective learning theories have emerged over the last few decades as self-directed learning, transformative learning, experiential learning, and andragogy. In the goal of building lifelong sustainable learning societies based upon knowledge, andragogy has been at the forefront of this process, as it is the most comprehensive of the four (Charungkaittikul et al., 2018). Andragogy is based upon six main assumptions: self-directedness, need to know, use of experience in learning, readiness to learn, orientation to learning, and internal motivation (Chan, 2010). To improve upon andragogy and facilitate lifelong learning communities, eight assumptions were developed from the work of Malcom Knowles. The following is a partial list of the most relevant assumptions (Charungkaittikul et al., 2018, p. 88):

1. Learning in a world of accelerating change must be a lifelong process.
2. Learning is a process of active inquiry with the initiative residing in the learner.
3. The purpose of education is to facilitate the development of the competencies required for performance in life situations.

4. Learners are highly diverse in their experiential backgrounds, pace of learning, readiness to learn, and styles of learning; therefore, learning programs need to be highly individualized.

Traditionally, educational systems have retained a teacher-centered teaching style, rather than the more effective and meaningful learner-centered educational experience. It is necessary “to abandon traditional teacher-centered assumptions and consider adopting and applying andragogical principles, learner-centered approaches, and constructivist principles in the classroom” (Chan, 2010, p. 34). Traditional education models typically focus on the emancipation of the individual, that is, focusing solely on the micro-context (knowledge relevant to individual career) of individual knowledge, rather than including the interdependent macro-structural context (broad scope of knowledge across subjects) (Note et al., 2020). Extending the andragogical field to include macro-level knowledge would encourage individuals to consider the social, political, and cultural contexts of their work, which would reshape their thinking and action (Chan, 2010). Sustainable lifelong learning will “result in the development of quality in people’s lives, community and society well-being, democratic participation, and social inclusiveness and cohesion” (Charungkaittikul et al., 2018, p. 90). Building a sustainable lifelong learning society incorporates the goals of transformative learning and builds on the concept of community. These concepts must be applied appropriately to ensure knowledge is not just a basis for individual emancipation, but intersubjective responsibility, that is, the idea that humans have a responsibility to others to attain common collectivist goals.

The practice of andragogy can shape individuals and create a knowledge economy, in line with transformative learning. Transformative learning is widely defined

as “a process by which previously uncritically assimilated assumptions, beliefs, values, and perspectives are questioned and thereby become more open, permeable, and better validated” (Cranton, 2005, p. 630). Oftentimes transformative learning is used as a model in education, but it must be implemented within a structure that allows learners “to be made more conscious of their ontological self to achieve critical reflections and connections needed for meaningful transformations... [moving the learner] from novice towards deeper understanding” (Natanasabapathy et al., 2019, p. 378). Furthermore, transformative learning needs to be about change, bringing about the distinction between *being* and *becoming*: “The state of *being* reflects how a person’s nature or behavior is at present. *Becoming* is a transition towards an embodiment of the desired change which will demonstrate a transformative movement” (Natanasabapathy et al., 2019, p. 370). Critical self-reflection is crucial in the transformative learning process.

Educators must create moments of community within their classrooms to facilitate honest, critical self-reflection to then bring about collectivism and an awareness of interdependency. Instead of a societal focus, community should be used as a central theme in education, placing the responsibility of educators to “[recognize] moments of community... [and create] the right conditions for moments of community to come about” (Note et al., 2020, p. 16). Creating a sense of community will further establish the goals of collectivism, giving students the ability to recognize interdependency across subjects, and realize that they are part of a community that has common goals to attain to progress and develop into the future.

In outdoor and environmental education, andragogical concepts and transformative learning techniques have become central to this educational field, even if

they have not been widely accepted or implemented. When individuals participate in structured outdoor adventure education, sometimes with Scouting, the National Outdoor Leadership School (NOLS), Outward Bound, or others, they often return home with a sense of personal transformation. In a study done in coordination with a NOLS outdoor adventure education program, many students believed they went through some kind of transformative learning and it resulted in a transformed self. The researchers clearly identified that the transformative learning process was in place, but “transformative learning is both a process and an outcome” (Meerts-Brandsma et al., 2020, p. 391). The outcome of transformative learning was the questionable aspect within the NOLS program, as explained by the researchers, but they also noted that “previous research has identified the difficulty students have transferring learning to other environments” (Meerts-Brandsma et al., 2020, p. 393). The process of transformative learning in outdoor adventure education is most characterized and facilitated “by a combination of challenging activities, supportive relationships and time to reflect” (Meerts-Brandsma et al., 2020, p. 393). In order to make transformative learning useful and applicable to life outside of outdoor adventure, educators must retain these three characteristics, in addition to including information around the themes of collectivism and interdependency.

Outdoor education has long focused on essential transformative learning in programs; however, these programs are short and lack the consideration of how to apply the gained knowledge outside of the program setting. Students in the outdoor adventure education program for the NOLS study did start the transformative learning process but did not finish the process. Many program participants described their transformation in the fact that “they uncovered the reasons that justified their existing beliefs, values, and

expectations. While their beliefs may not have switched... their increased understanding of why they held certain beliefs did and that transformation felt profound [to them]" (Meerts-Brandtsma et al., 2020, p. 388). For these students, this transformation was extremely influential, beginning at understanding themselves instead of immediately changing. To fulfill the transformative learning process, the outcome of transformative change must be met, but transformative learning needs to be seen as an ongoing process to reach perspective transformation. Even if the entire process was not completed in participants' time in the program, learning and self-reflection can occur after the experience. There is no deadline to change, it is an ongoing process that is facilitated by programs like these. The education must go further to tie in community collectivism and how systems are interdependent on individual change and influence.

As with any specific educational field, the concepts of andragogy and transformative learning still apply as critical foundations necessary in Leave No Trace (LNT) education. An ever-important facet of outdoor and environmental education is the seven LNT Principles. These guiding principles have become the main educational facilitator of environmental stewardship in outdoor recreation; they are often displayed at protected natural spaces to remind visitors of their responsibility to do their part to preserve the environment. The seven principles are as follows (LNT Center for Outdoor Ethics, 2021a):

1. Plan ahead and prepare.
2. Travel and camp on durable surfaces.
3. Dispose of waste properly.
4. Leave what you find.

5. Minimize campfire impacts.
6. Respect wildlife.
7. Be considerate of other visitors.

These seven principles are indispensable to outdoor recreation, providing an easy tool to minimize human impact on the natural world. Each principle is a broad rule to practice while recreating in the outdoors; the principles incorporate many actions that should be avoided. A study was conducted to examine the attitudes of overnight backcountry visitors' regarding 22 common backcountry behaviors, with each relating to an LNT principle (Vagias et al., 2010). This study suggests that “educational efforts need to target not only the seven general LNT principles but, more importantly, the specific behaviors that underpin each principle” (Vagias et al., 2010, p. 26). Instead of educating on the LNT principles in general, specific behaviors need to be included as examples. In another study at Adirondack Park, an online survey was sent out to staff and affiliates, finding that “when asked how frequently Leave No Trace was used in the Adirondack Park, 48% of respondents said it was *Used occasionally*” (Lawhon, 2020, p. 10). The need for a more effective LNT education program is clear, but the researcher further points to the need for Adirondack Park to implement “locally-tailored, Park-specific and activity-based [LNT] information” (Lawhon, 2020, p. 7). Using Adirondack Park as an example of an LNT program with general messaging, it can be seen that LNT programs must include possible visitor actions, along with location-specific possibilities.

Most protected natural spaces feature LNT messaging, though oftentimes it may be overlooked by park visitors or brushed off when discussed. This begs the questioning of program design for Leave No Trace education. A study was conducted using an in-

person visitor survey across three protected spaces under the Wyoming State Parks, Historic Sites and Trails Agency. Aimed at frontcountry visitors' attitudes towards LNT principles, the study found that "education-based communication efforts have an increased likelihood of meaningfully influencing behavioral intent if they are tailored to state parks, focus on why LNT practices are appropriate, and address how those practices are effective at minimizing impacts" (Lawhon et al., 2017, p. 67). To improve LNT education, the programs must reflect why such rules exist and how these principles positively affect the environment. On the same note, a similar study was done for a number of National Parks, finding the same and concluding that "perceived effectiveness of Leave No Trace Practices is a meaningful predictor of future behavioral intent" (Lawhon et al., 2013, p. 35). Explaining how these practices effectively reduce impacts, park visitors can see how their actions have direct effects on the environment and engage in positive change.

Andragogy and field-based education have both paved the way for specialized education to become mainstream. Drawing on many other concepts and theories, Leave No Trace education attempts to advocate a simple message of seven guiding principles to those who participate in outdoor recreation. Many are not familiar with or haven't been exposed to the Leave No Trace principles, leading to a need for more comprehensive programs that effectively encourage pro-environmental behaviors.

Purpose of the Study

The purpose of this study was to examine the educational methods utilized by the Leave No Trace Center for Outdoor Ethics to determine the best practices to cultivate and instill the principles of Leave No Trace.

Research Questions

This study attempted to answer the following research questions:

1. What LNT educational methods are utilized by the LNT Center?
2. What andragogical concepts are incorporated into LNT educational methods by the LNT Center?
3. How effective are the educational methods utilized by the LNT Center?
4. How effective is the incorporation of andragogical concepts in LNT education by the LNT center?

Chapter 2

METHODS

The purpose of this study was to examine the educational methods utilized by the Leave No Trace Center for Outdoor Ethics to determine the best practices to cultivate and instill the principles of Leave No Trace. This chapter includes the following sections: description of organization, description of instrument, and description of procedures.

Description of Organization

A case study was conducted on the Leave No Trace Center for Outdoor Ethics to assess their educational practices and resources. Leave No Trace was incorporated as a 501(c)(3) nonprofit organization in 1994, although the Leave No Trace concept has been around for centuries. The mission of the Center is: “The Leave No Trace Center for Outdoor Ethics provides proven, research-based solutions for the protection of the natural world” (LNT Center, 2021b, p. 1). The LNT Center accomplishes this mission by administering programs focused on helping people care for the outdoors through education, acquisition of skills, and research. In cooperation with the public and officials managing public lands, the Center “focuses on educating people – instead of costly restoration programs or access restrictions – as the most effective and least resource-intensive solution to land protection” (LNT Center, 2021b, p. 2).

With a focus on providing resources and research for environmental protection, the Leave No Trace Center retains minimal overhead and a reduced environmental footprint. The Center is based out of Boulder, Colorado and has a staff of 14, in addition

to a volunteer Board of Directors that has 11 outdoor professionals from around the country. The Center also utilizes Agency Advisors who serve as LNT representatives in major land management organizations, including the National Park Service, USDA Forest Service, Bureau of Land Management, US Fish and Wildlife Service, and the US Army Corps of Engineers. The Center also has State Advocates, who serve as volunteers across the United States that are passionate about the environment and choose to educate and train local communities in Leave No Trace. The LNT Center has a partnership with Subaru where cars and funding are provided to State Advocates to tour individual states to aid in LNT's mission to educate people across the country (LNT Center, 2021c). The Center facilitates Awareness Workshops, Online Awareness Courses, PEAK Online, Trainer courses, and Master Educator courses. They also accredit and partner with other organizations to offer trainings and Awareness Workshops.

Description of Instrument

The instrument used in this study was a case study guide developed by the researcher (See Appendix A). This instrument was applied to uncover attributes of LNT educational programs by the LNT Center. The LNT Center educational programs analyzed included Awareness Workshops, Online Awareness Courses, PEAK online, Trainer courses, and Master Educator courses. Some LNT educational program attributes evaluated include that the program was comprehensive, location-specific, activity-based, context-specific, age-specific, skills-based, and if the program features overview information. A pilot study was conducted using the instrument on the LNT educational methods of the Boy Scouts of America; no changes were made to the instrument.

Description of Procedures

A case study was conducted on the Leave No Trace Center for Outdoor Ethics to assess their educational practices and resources. The purpose of this study was to examine the educational methods utilized by the Leave No Trace Center for Outdoor Ethics to determine the best practices to cultivate and instill the principles of Leave No Trace. The instrument used in this study was a case study guide developed by the researcher, implemented within a two-week period in February. The organizational practices were found on the Center's website, specifically in their educational resources and programs with Leave No Trace. The programs were analyzed using the instrument, and the most effective LNT educational practices were evaluated regarding what attributes made the programs work. Program details and best practices were analyzed qualitatively.

Chapter 3

PRESENTATION OF THE RESULTS

The purpose of this study was to examine the educational methods utilized by the Leave No Trace Center for Outdoor Ethics to determine the best practices to cultivate and instill the principles of Leave No Trace. A case study was applied to examine the Leave No Trace Center for Outdoor Ethics. This chapter includes the following sections: LNT educational methods and andragogical concepts in LNT education.

The educational programs offered by the Leave No Trace (LNT) Center have been identified as follows: Awareness Workshops, Online Awareness Courses, PEAK (Promoting Environmental Awareness in Kids) Online, Trainer Courses, and Master Educator Courses. Awareness Workshops, Trainer courses, and Master Educator courses can be facilitated by organizations other than the LNT Center as long as they obtain accreditation and follow strict guidelines set by the LNT Center for each type of program. For this case study, the instrument was implemented on the resources and programs offered specifically by the LNT Center.

LNT Educational Methods

The LNT Center for Outdoor Ethics has long been the primary organization focused on increasing environmental stewardship through the education and messaging of the seven fundamental LNT principles. These seven guiding principles are the foundation of the LNT Center for Outdoor Ethics. Through online trainings, in-person trainings with the Center, and trainings with other accredited organizations, the LNT Center has strived

to foster environmental awareness in children and adults with these many program offerings.

Each LNT educational program has a different focus and purpose. The Awareness Workshops are usually designed for the general public or youth groups, focusing on disseminating skills and techniques that are paramount to LNT. Awareness Workshops may require a fee to attend but can also be free depending on if it is offered by the LNT Center or an accredited organization. The minimum requirement of the Awareness Workshop is to introduce the seven LNT principles along with the mission of the Center. Typically, in Awareness Workshops, participants are given an overview of the LNT principles in a presentation with examples of skills and techniques necessary to practice LNT. Participants are then given the opportunity to put those skills into practice. For example, participants may learn in the presentation how to best pack out trash, and subsequently after they would practice compacting their trash and packing it out. Awareness Workshops also provide a glimpse into other, more complex and comprehensive, programs and roles offered by the Center that may interest participants, such as the Trainer or Master Educator courses. Participants are also encouraged to join and support LNT and are shown the available LNT resources on the website. In all, awareness workshops are meant to give an overview of LNT and the LNT Center, as well as offer tailoring to age groups and a skills-based approach.

Awareness Workshops are also offered in an online format, in addition to PEAK Online, which is an online awareness program specifically designed for children ages seven to twelve. Both online programs are free to the public. The Online Awareness Course educates participants on what LNT is, what the principles are, why they are

needed, visitor impacts that stem from a lack of LNT practices, where LNT is relevant (everywhere), and how to get more involved and take the LNT Pledge. This approach follows the attributes provided by the Awareness Workshop, including overview, but the online approach is not skills-based and does not allow direct LNT application. The PEAK Online program is similar to the Online Awareness Course, but instead offers an interactive click-through presentation that features friendly narration and games for children. The games give children the opportunity to put the LNT principles into virtual practice. For example, one of the games has a shelf of items that children must drag into their virtual hiking backpack to see what they need to bring and what they should avoid bringing. Participants are then given a PEAK certificate. PEAK is an age-specific LNT educational program that has a simple introduction to LNT skills with an overview of the LNT principles.

LNT Trainer and Master Educator courses are purposed to educate individuals in a more comprehensive and specific manner to produce LNT Trainers that will design and facilitate Awareness Workshops and Master Educators who will educate LNT Trainers. The LNT Trainer course is a two-day immersive program that focuses on the seven LNT principles and techniques around how to disseminate LNT skills in Awareness Workshops and informal settings with family, friends, peers, coworkers, and clients. Central to the course is the adoption of appropriate minimum-impact skills and ethics related to LNT. Trainers in training are given the opportunity to lead a short presentation for the group on an assigned LNT topic. The curriculum of the Trainer courses prepares participants for a variety of educational settings, such as camps, parks, schools, and backcountry and frontcountry areas. Trainer courses are currently being held both

virtually and in-person around the country, bringing in location and context specificity when it comes to the application of LNT principles. The trainer course is a combination of skills-based, dissemination-specific, and possibilities for location- and context-specific educational methods. LNT Trainer course participants follow a condensed version of the Master Educator Course.

The LNT Master Educator course is the pinnacle of LNT education. It is usually offered as a five-day immersive program in the backcountry. The course most often requires payment and travel to the destination, making it the more professional and expensive training option for those most dedicated to LNT. This field-based course provides a comprehensive training on LNT skills and ethics with practical applications and multiple learning methods. Participants engage in scenarios, discussions, demonstrations, and hands-on activities that serve to engrain the seven principles and necessary skills into participant knowledge. Beyond the Trainer course, the Master Educator course includes the examination and practice of numerous communication techniques and teaching styles. Like the Trainer course, participants are required to design and present a LNT lesson for peers. The Master Educator course comprises many attributes such as being dissemination-specific and skills-based like the trainer course, but also incorporates location- and context-specific knowledge due to the many locations the course can be offered in. Since the program is typically held in the backcountry, the program requires specific applicational techniques to adapt to different environments. This is done so participants understand that LNT is always dependent on context and location to be an effective tool to promote environmental stewardship. Participants are also taught how to adapt their own LNT educational programs to any setting, giving them

a versatile ability to teach anywhere. The Master Educator course also has the possibility to be activity-specific, as the course can be held with a focus in hiking, backpacking, kayaking, rock climbing, or any other outdoor activity. Regardless of setting, the Master Educator course is designed to prepare LNT educators for any possibilities in which they would desire to disseminate LNT information, producing a comprehensive view of LNT rather than a general view like in the other programs. Master Educators go on to design and facilitate both LNT Trainer courses and Awareness Workshops.

Andragogical Concepts in LNT Education

Cardinal to the LNT programs are andragogical concepts, which foster positive interpretations of the LNT message and help to achieve program goals. For the purpose of this study, andragogical concepts are viewed as synonymous with pedagogical concepts as they both attempt to achieve the same educational goals of practical application and transformation. Andragogical concepts present in LNT programs are key drivers for program goals. For in-person Awareness Workshops, experiential learning, or learn-by-doing, was at the forefront of the program. Awareness Workshops seek to teach participants the necessary LNT skills and ethics and provide the opportunity to practice those skills. The experiential learning seen with in-person Awareness Workshops does not translate to the online versions. The Online Awareness Course does not contain any information related to the application of skills, and thus, these online participants are unable to engage in actual experiential learning. Participants are neither given the time nor opportunity to apply learned skills like they would in an actual workshop setting. Furthermore, the PEAK Online program is more like an Online Awareness Course for

children, but with a virtual approach to experiential learning. Children are given the chance to practice their newly learned skills in the online games within PEAK, but it is still not true experiential learning since they are not learning by physically doing. Both online educational programs make way for self-directed learning, a facet of andragogy, providing users with resources and time to learn the material at their own pace, but do not provide proper experiential learning.

The more intense and specific educational programs, such as the Trainer and Master Educator courses, permit more engaging and in-depth learning methods. LNT Trainer courses employ experiential learning at its finest. Course participants engage in student-centered activities that help instill minimum impact skills and ethics. In designing and producing a presentation on an assigned LNT topic, participants are engaging in experiential learning as they practice how to best disseminate LNT information to others. Moments of community are also fostered in this program, with peers being the central focus for practice and providing constructive criticism to improve individual educational techniques. Like the Trainer course, the Master Educator course is focused on experiential learning with the peer LNT presentation. The course also incorporates aspects of transformative learning. Through multiple teaching methods such as discussions, scenarios, hands-on activities, and demonstrations, participants are exposed to transformative learning and are given the opportunity for critical self-reflection around outdoor skills and ethics. By working through challenging activities with peers and instructors, participants are enveloped in a supportive environment to engage in critical self-reflection.

Chapter 4

DISCUSSION AND CONCLUSIONS

Leave No Trace (LNT) is imperative in the field of outdoor recreation to protect natural spaces and preserve them for generations to come. Exposure to LNT is pivotal in the development of environmental stewardship in children and adults. This concluding chapter includes the following: a discussion of the findings, limitations of the research, conclusions based on research questions, and recommendations for the future.

Discussion

The educational methods utilized by the LNT Center for Outdoor Ethics vary in levels of engagement and effectiveness. The various programs offered include Awareness Workshops, Online Awareness Courses, PEAK Online, Trainer courses, and Master Educator courses. The effectiveness of these programs will be evaluated in accordance with previous research, along with analyzing the industry implications and organizational recommendations related to the different programs.

Awareness Workshops held in-person employ a greater level of engagement and practical application than Online Awareness Courses and PEAK Online and are more effective in developing environmental stewardship. The LNT Center designed in-person awareness workshops to disseminate LNT information and provide the opportunity for students to apply newly learned skills to actual practice. Chan (2010) detailed the need for educational programs to transition away from teacher-centered teaching styles to learner-centered educational experiences for more meaningful and effective education.

The learner-centered approach of in-person awareness workshops help to instill LNT outdoor ethics into students' knowledge and practice, rather than a teacher-centered approach which would consist solely of information presentations instead of practical application as a part of experiential learning. The Online Awareness Courses teach the same information as the in-person awareness workshops, but without the practical application in Awareness Workshops. The online course applies a teacher-centered approach as it comprises only information presentation and no practical skill application. Awareness Workshops are effective forms of LNT information and skill education, incorporating andragogical concepts that aid in surface-level learner information and skill retention through experiential learning and a student focus. While Awareness Workshops are effective forms of LNT education, the same cannot be said for Online Awareness Courses or PEAK Online.

Online Awareness Courses and PEAK Online are distinct in their purposes and impacts. Online Awareness Courses are void of the practical applications necessary for experiential learning and only focus on information presentation, a teacher-centered approach. Charunkaikkul et al. (2018) purposes proper education as the development of necessary competencies that are required for real life application and performance. In order for an education method to be effective, it must incorporate practical skill development for those skills to translate to real life application. This highlights the ineffectiveness of online LNT programs as compared to the in-person options. The age-specific PEAK Online is similar to the Online Awareness Workshop in its approach, but it does incorporate limited skill application in virtual games for children. PEAK Online is seen as effective for early exposure to LNT, but ineffective for LNT application. It lacks

physical, practical application of information and skills like the Online Awareness Course, but does have some application in the online games, just not enough to be considered an effective LNT educational method that leads to increased environmental stewardship practices. PEAK Online should be used as an early exposure tool for children ages four to eight only, due to the absence of real-life skill application necessary for children ages eight to twelve. Children over the age of eight should attend an Awareness Workshop instead of the virtual options to gain the proper knowledge and skills needed to recreate responsibly in the outdoors at their age. The two online programs above employ self-directed learning, a more ineffective teaching strategy than that of experiential (Awareness Workshops) or transformative learning. Unlike LNT Trainer and Master Educator courses, none of the three educational programs above attempt to begin the process of transformative learning. These three courses are effective in teaching surface-level information and a limited skill set, while Trainer and Master Educator courses go deeper to cultivate and instill environmental stewardship and still utilize learner-centered approaches.

Trainer and Master Educator courses are the most influential and effective programs for LNT education, although they are the most inaccessible for disadvantaged groups due to costs, and most difficult to complete out of all LNT programs due to program structure. Trainer courses facilitate information presentations by instructors, increased LNT skills and outdoor ethics knowledge and application for students, and an opportunity to apply trainer knowledge to a practice educational session to peers, all within a two-day program. Master Educator courses employ the same techniques as the trainer courses, but further examine various communication techniques and teaching

styles through discussions, scenarios, demonstrations, and hands-on activities within a five-day immersive program. Meerts-Brandtsma et al. (2020) establishes that transformative learning in outdoor education is mainly facilitated through the combination of challenging activities, supportive relationships, and time to reflect during the education program. The research also points to the fact that transformative learning is both a process and an outcome. The outcome of the transformative learning process is perspective transformation. In Trainer and Master Educator courses, participants begin the transformative learning process through the various challenging activities ingrained in the program such as the practice peer presentation and discussions designed to promote critical self-reflection. Natanasabapathy et al. (2019) notes the necessity for critical self-reflection in the transformative learning process to influence the knowledge acquisition process of participants to that of a novice understanding to one of a deeper understanding with the embodiment of a constructivist lens to achieve perspective transformation within each individual participant. By combining information dissemination and practical application with critical discussions, scenarios, and challenging activities within a peer- and learner-centric environment, critical self-reflection is possible in these programs to attain perspective transformation. Participants are given the opportunity to uncover their individual biases, including their assumptions, beliefs, values, and perspectives, specifically surrounding environmental stewardship and LNT.

Trainer and Master Educator courses both encompass aspects of transformative learning, with varying degrees of immersion within the transformative learning process. Both courses require participants to design and facilitate an LNT presentation to their peers, tying experiential learning back into transformative learning. Trainer courses are

condensed Master Educator courses, so participants may not go as deep into the transformative learning process as Master Educators do, but they still begin the process either way and have the chance to apply their knowledge after the program to further engage in the transformative learning process. Charungkaitikul et al. (2018) lists another learning assumption as understanding that learning within a changing world and society is a lifelong process. A transformation is not guaranteed for participants in these programs, especially since this transformative process may continue long after participants complete the course. Master Educators may not even achieve perspective transformation in the five-day program. Master Educators go on to teach Trainer courses and Awareness Workshops, which can further involve the transformative learning process to achieve a deeper understanding of interdependency and environmental stewardship to hopefully achieve perspective transformation in their application of the knowledge and skills learned in the Master Educator course. Trainer and Master Educator courses are more effective LNT educational methods than the other three programs offered by the LNT Center due to the value that an immersive outdoor education experience offers in regard to beginning the transformative learning process to become experts in and representatives of LNT. To improve these two programs, the LNT Center should provide a guide to participants on how to create change in their communities with their new knowledge base and how to fulfill the transformative learning process and further engage in critical self-reflection outside of the LNT course experience.

The characteristics unique to Trainer and Master Educator courses can also be standardized with LNT messaging in frontcountry and backcountry areas to improve the environmental awareness of natural space visitors in the field of outdoor recreation. The

effectiveness of LNT educational programs can be seen because of the andragogical concepts incorporated in them but can also be attributed to the ways in which LNT is framed in the different programs. Awareness Workshops can be tailored to age groups and are skills-based along with providing an overview of LNT. Both online courses solely give an overview of LNT, with limited skills-based information in PEAK, not enough to deem the entire program as skills-based like the Awareness Workshops. Trainer and Master Educator courses teach LNT in manners that are skills-based, dissemination-specific, location-specific, and context-specific. Master Educator courses also offer the ability to be activity-specific, while trainer courses do not. Vagias (2010) found that in order to make LNT educational efforts more effective, methods must target specific behaviors that are under the umbrella of the seven general LNT principles, meaning the LNT educational method must be context-specific to result in visitor behavior change. Every natural space and every visitor demographic are different in regard to which LNT principles will be most applicable for visitors. Specific behaviors must be discussed in a proposed LNT educational program so visitors understand that even if they are following the seven general LNT principles, dilemmas may surface during their visit that require them to apply the general principles to specific behaviors they may exhibit, even if those behaviors are not explicitly detailed in the actual principles.

The inclusion of location- and activity-specific LNT information is necessary to develop frontcountry and backcountry LNT education programs to mirror the effectiveness of Trainer and Master Educator courses, along with the attributes previously mentioned. Lawhon (2020) establishes the need for LNT education to include location-

and activity-specific LNT information so that it can be properly applied. The location-specific requirement is similar to the context-specific requirement; every environment requires a varying application of LNT. Visitors may be unfamiliar with a natural space and therefore not understand how LNT is specifically applied to that unique environment. LNT is typically used within a single activity context; most often it is applied during hiking and backpacking activities. In order to provide accurate LNT information that will be used in any part of a natural space, LNT education must include activity-specific information so that visitors understand that LNT is applied while participating in any activity, including hiking, backpacking, walking, kayaking, rock climbing, off roading, or any other outdoor activity, even just visiting a popular landmark. A proposed LNT educational program must incorporate some level of skills-based knowledge and application in order to be effective. Visitors must understand how LNT information and knowledge are transferred into actual practice while recreating. Master Educator courses are the most effective in the utilization of program attributes that are skills-based, location-specific, context-specific, and activity-based, and should be used as a model to develop frontcountry and backcountry LNT educational programs across the United States.

There were some limitations present in this study that must be considered due to the impact they may have had on the outcome of the study. Since this study was conducted during the coronavirus pandemic, only online resources were able to be used, which may have limited research findings. Also attributable to the pandemic, no in-person data were able to be collected at natural spaces that could have been utilized to gauge visitor behaviors and attitudes related to LNT, or to examine LNT educational

methods current in potential study locations. Finally, the researcher held a position as the Leave No Trace Trainer in their time in the Boy Scouts of America, creating a prior knowledge base for the researcher on how to teach LNT to younger scouts.

Leave No Trace education is essential in the development of environmental stewardship in children and adults in order to protect natural spaces and preserve them for generations to come. This study analyzed the educational methods and resources offered by the Leave No Trace Center for Outdoor Ethics. It presented the educational methods currently in practice by the Center, the effectiveness of those different methods, and how LNT Center program attributes relate to previous research and how LNT Center methods can be transferred to frontcountry and backcountry LNT education. It found that LNT educational programs that are skills-based, location-, activity-, behavior-, context-, and age-specific are the most effective forms of LNT education. This study functions as a guide to design and implement effective LNT education programs in natural spaces to foster environmental stewardship and properly educate the public.

Conclusions

Based on the findings of this study, the following conclusions are drawn:

1. The LNT Center utilizes Awareness Workshops (overview, skills-based, age-specific), Online Awareness Courses (overview), PEAK Online (overview, age-specific), Trainer courses (overview, skills-based, dissemination-specific, location-specific, context-specific), and Master Educator courses (overview, skills-based, dissemination-specific, location-specific, context-specific, activity-based).

2. The LNT Center incorporates andragogical concepts of experiential learning in Awareness Workshops, self-directed learning in Online Awareness Courses and PEAK Online, experiential learning and the beginning of transformative learning in Trainer and Master Educator courses.
3. The Master Educator course is the most effective LNT educational method, with Trainer Courses being slightly less effective since they are not activity-based, and Awareness Workshops being moderately effective due to what they lack; Online Awareness Courses and PEAK Online are the most ineffective educational methods offered by the Center.
4. Self-directed learning is the most ineffective concept incorporated into the virtual programs, whereas the concept of experiential learning is most effective in the three in-person programs, and the concept of transformative learning is effective to an extent in Trainer and Master Educator courses since the transformative process is not completed in the time allotted.

Recommendations

Based on the conclusions of this study, the following recommendations are made:

1. Educators at natural spaces should adopt educational strategies similar to those of the Awareness Workshops, Trainer courses, and Master Educator courses to incorporate LNT program attributes in frontcountry LNT education.
2. LNT educational programs should be designed to give visitors an overview of LNT, provide LNT skills and resources, and present age-, behavior-, location-, context-, and activity-specific LNT information.

3. Educators should consider the implications of andragogical concepts in their own educational programs and how to facilitate critical self-reflection in a limited time frame.
4. The LNT Center should provide a guide to Trainer and Master Educator course participants on how to create change in their communities with their new knowledge base that details how to fulfill the transformative learning process and further engage in critical self-reflection outside of the LNT course experience.
5. The LNT Center should recategorize the PEAK Online program for children ages four to eight for early LNT exposure, while directing children ages eight and up to attend Awareness Workshops with parents or school groups.
6. An LNT educational program should be developed with the model of the Awareness Workshops but implemented in public elementary schools.
7. A study should be conducted to analyze the efficacy of virtual LNT educational programs in actionizing environmentally friendly habits in children during the practice of LNT in natural spaces.
8. A study should be conducted to analyze the efficacy of a location-, context-, and activity-specific LNT educational program at various natural spaces in which each program would follow the same structure, but content would be tailored for each.

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APPENDIXES

Appendix A
INSTRUMENT

Leave No Trace Educational Programs				
Program Type	Program Attributes	Description of Program	Program Focus	Andragogical Concepts
	(comprehensive, location-specific, activity-specific, context-specific, age- specific, behavior- specific, dissemination- specific, skills-based, overview)			
Awareness Workshop				
Online Awareness Course				
PEAK Online				
Trainer Course				
Master Educator Course				