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The Development and Validation of the Leave No Trace PEAK Assessment Scale (PAS)

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Abstract

The *Leave No Trace Center for Outdoor Ethics* developed the *Promoting Environmental Awareness in Kids (PEAK)* program to teach children the seven *Leave No Trace* principles. The purpose of this study was to develop a valid and reliable measurement tool for *Leave No Trace* to assess the effectiveness of the *PEAK* program. Quantitative analyses of the data were used to determine the psychometric properties of the *PEAK* Assessment Scale (PAS) and children's knowledge of the *Leave No Trace* principles before and after participation in the *PEAK* program. Results supported the use of the PAS as a sound measurement tool for assessing the *PEAK* program.

Keywords: environmental education, pro-environmental behaviors, low-impact skills, *Leave No Trace*, *Promoting Environmental Awareness in Kids*

Introduction

Intentional and engaging instruction of environmental education is important to increasing environmental stewardship in children (Blanchard & Buchanan, 2011). With the *No Child Left Inside* movement aimed at reconnecting children with nature, environmental education programs such as *Leave No Trace's Promoting Environmental Awareness in Kids (PEAK)* program are key to teaching children the skills necessary to make responsible decisions when recreating in the out-of-doors (Louv, 2008). Furthermore, once a program is developed it is important and often critical to current and future funding support to determine whether or not it is effective. One way to accomplish this is to create an assessment tool designed to determine if the intended goals of the program have been met (Baldwin, Caldwell, & Witt, 2005).

While the *PEAK* program has been in existence for a number of years, formal assessment of the program's effectiveness has not been empirically evaluated, and development of an assessment tool is lacking. To understand the impact of the *PEAK* program, the *Leave No Trace Center for Outdoor Ethics*, Old Dominion University, and the State University of New York at Cortland collaborated to develop the *PEAK* Assessment Scale (PAS) to serve as a tool to assess the effectiveness of the program. Hence, the purpose of this study was to determine the psychometric properties of the newly developed PAS and determine if it was a valid and reliable measurement tool.

Literature Review

With the increase in technology and lack of interest in the outdoors, children are spending more time indoors and have become disconnected from nature (Special Report on Youth, 2010). Moreover, this disconnect between youth and the natural environment is not only negatively impacting the physical and mental health of children, it is also contributing to a lack of stewardship for the environment among young people. For example, in a longitudinal (1976 to 2005) study measuring adolescents' concern for the environment, Wray-Lake, Flanagan, and Osgood (2008) found that taking on personal responsibility for the environment, or pro-environmental behavior, has declined in adolescents. Rather than personal responsibility, youth feel responsibility for the environment should fall to the country's leadership rather than one's self. Other studies have demonstrated the mental and physical benefits children can experience when they spend time in nature and participate in environmental and outdoor educational opportunities (Berman, Jonides, & Kaplan, 2008; Wells, 2000). Although getting children in nature is crucial to child development, history shows that the increased use of recreational and natural areas increases the chances of negatively impacting the environment (Marion & Reid, 2007). With the effort to get youth into the out-of-doors, it is crucial to provide educational programs (e.g., *PEAK*) to teach children low-impact skills necessary to help sustain the natural environment.

Development of pro-environmental attitudes

The future of our environment is dependent on the development of future environmental leaders. Environmental stewardship is defined by the *United States Environmental Protection Agency* as: ...the responsibility for environmental quality shared by all those whose actions affect the environment, reflected as both a value and a practice by individuals, companies, communities, and government organizations. Positive stewardship behavior demonstrates acceptance of this responsibility through the continuous improvement of environmental performance to achieve measurable results and sustainable outcomes (2005, p. 8).

The ultimate goal of environmental education is to foster pro-environmental attitudes and behaviors that ultimately lead to environmental stewardship (Davis, 1998; Short, 2010). To develop environmentally literate individuals, it is important to engage learners through active participation and work toward improvement of environmental conditions (Blanchard & Buchanan, 2011). Programs designed to get children engaged in outdoor and environmental activities have been shown to increase pro-environmental attitudes in children, which could potentially lead to environmentally active adults (Blanchard & Buchanan, 2011; Waliczek & Zajicek, 1999). Corriero (2004) encouraged educators to target young people because these youth have more power and potential to create change on global and local levels than youth of previous generations.

How does environmental stewardship form in young people? Studies indicate that experiences in childhood lead to similar actions and attitudes as an adult (Chawla, 1999; Chawla & Cushing, 2007).

Experiences such as the combination of everyday interaction with nature as a child; parental role modeling of pro-environmental behavior; prolonged engagement with youth groups or other environmental organizations; and educational material about nature have all been shown to help form pro-environmental attitudes and behaviors in children, and may ultimately lead to environmental stewardship later in life (Arnold, Cohen & Warner, 2009; Chawla, 1999; Chawla & Cushing, 2007; Eagles & Demare, 1999). Considering the goals of environmental education and the power of youth, programs designed to teach young people how to behave responsibly in the outdoors and that also promote environmental stewardship, such as *PEAK*, may be critical elements for sustainable enjoyment of the natural world.

Leave No Trace and Promoting Environmental Education in Children

Formation of the *Leave No Trace Center for Outdoor Ethics* stemmed from the lack of knowledge user groups possessed about human impact on the environment during recreational use. Through a partnership between several organizations, including land management agencies (e.g., the United States Forest Service, the National Park Service), and the National Outdoor Leadership School (NOLS), the *Leave No Trace* principles and curriculum were developed to help teach people ethical and low-impact practices when interacting with the natural environment. To increase the quality of the environment as well as the quality of the experience for visitors, the mission of *Leave No Trace* is to create "hands-on minimum impact training" opportunities that engage participants to use minimum impact skills in an effort to decrease degradation of the natural environment (Leung & Marion, 2000; Marion & Reid, 2001 & 2007). A study conducted by Daniels and Marion (2005) found that the change of knowledge, ethics, and behavior of a group of people who participated in a *Leave No Trace Instructor* training program significantly increased, indicating that curriculum and educational programs can effectively "minimize the environmental impacts caused by outdoor recreationists" (Daniels & Marion, 2005, p. 1).

In 2001, the *Leave No Trace organization* recognized the value and importance of educating children about the seven principles that served as the foundation of its programs. In partnership with *Recreation Equipment, Inc. (REI)* the *Promoting Environmental Awareness in Kids (PEAK)* program was created and designed to teach children about the environment and how to recreate responsibly in the out-of-doors (www.lnt.org). The seven "kid friendly" principles, based on the original seven principles of *Leave No Trace*, include:

- (1) *Know Before You Go*, teaching children the skills necessary to prepare in advance prior to recreating outside;
- (2) *Choose the Right Path*, teaching techniques and knowledge about how to protect different environments by making decisions that have less impact on the environment;
- (3) *Trash Your Trash*, teaching skills necessary to keep the environment clean from litter and other waste;
- (4) *Leave What You Find*, teaching the importance of leaving artifacts and other natural items behind for the next person to enjoy;
- (5) *Be Careful With Fire*, teaching the techniques for making responsible decisions about how, when, and where to have a fire;
- (6) *Respect Wildlife*, teaching children how our behavior can affect wildlife and learn how to appreciate wildlife from a distance; and
- (7) *Be Kind To Other Visitors*, teaching kids how to be respectful of others (www.lnt.org).

The primary goals of the *PEAK* program are to: "(a) increase awareness of *Leave No Trace*, (b) promote stewardship of public lands, (c) meet the demands of diverse youth populations, and (d) have fun" (www.lnt.org). To meet these goals, *Leave No Trace* and REI created the *PEAK* training program to provide educators with training material on how to use the *PEAK Pack* in a way that ensures that the curriculum will be taught using effective teaching methods. The *PEAK Pack* includes ready to use activities, each with a detailed lesson plan. In addition to the lesson plans, the *PEAK Pack* also contains a video presentation about how to incorporate specific teaching techniques and tactics that are typical of constructivist learning models.

According to constructivist learning theory "learners construct—rather than record—understanding of what they study" (Eggen & Kauchak, 2004, p. 305). When learning is enhanced and constructed through active hands-on experience (learning by doing), there is a greater likelihood that the material is retained, and thus, a greater chance of new behaviors being adopted. According to Light (2008), "Constructivism adopts a holistic view of learning and cognition that extends beyond the mind as a separate entity to include the body and all its senses" (p. 23). New knowledge is constructed through individual experiences and behavior is adapted based on what that individual already knows or believes. By increasing the retention rate of the low-impact skills through active learning, an increased sense of care for the environment can result, leading to more pro-environmental behaviors. (Adkins & Simmons, 2002; Eggen & Kauchak; Gilbertson, Bates, McLaughlin, & Ewert, 2006). *Leave No Trace* promotes hands-on opportunities and encourages educators to get children outside and experience the content of the program. For instance, in the instructional video, *Leave No Trace* provides an example of how educators can show children to "leave what they find" when a group runs across a skull during an excursion outside. In the video, the scenario shows educators engaging the children in a discussion as to why leaving the skull behind for other visitors to enjoy is important from a historical perspective. When used correctly, the ready-to-use activities contained within the *PEAK Pack* incorporate and apply the seven *Leave No Trace* principles to help teach children how to act responsibly in nature and promote stewardship of the natural world.

Methods

The main goals of *Leave No Trace* are to increase awareness of the seven principles and to promote stewardship of public lands. A scale was developed and designed using the *PEAK* program as the basis to assess children's attitudes and opinions regarding their behavior in the natural environment. This process occurred in multiple iterations, the first of which was to construct an initial list of items based on the stated goals of the *PEAK* program and specific activities in the *PEAK Pack*. Following that, a pilot test was conducted using the revised scale to determine Cronbach alpha reliability estimates for each subscale. Specific details regarding each step of the scale development process follow.

The First Scale

During the initial design stage, a 40-item Likert-type scale was constructed based on the stated goals of the *PEAK* program and specific materials found in the *PEAK Pack* activities. The first phase in developing the *PEAK* Assessment Scale (PAS) included creating five items for each principle as well as an additional five items designed to measure general feelings about *Leave No Trace* and the natural environment. For instance, one of the items stated, "It's important to teach my friends and family about the *Leave No Trace* Principles." Response options ranged from 4 = *strongly agree* to 1 = *strongly*

disagree. To determine if respondents read each item carefully, eight reverse coded items were embedded in the scale. The scale was reviewed and revised based on feedback from a panel of education experts, including an education administrator from the *Leave No Trace Center for Outdoor Ethics*. The initial PAS was tested on fifth and sixth grade elementary school children in the spring of 2010 on two occasions to assess the level of readability and the amount of time it took to complete the assessment. Results indicated the need to include “*Don’t Know*” as a response option because some children lacked any knowledge about the key principles prior to participating in the *PEAK* program (Miller, Brown, Hill, Shellman, & Gómez, 2010).

Based on results from the preliminary test of the PAS, a second phase of scale development was completed in which the PAS was revised and reduced to 36 items with three to six items per *PEAK* Principle. This version of the PAS was administered through a pilot program with a group of fifth and sixth graders from a local elementary school to assess the psychometric properties of the scale in the spring of 2010. A total of 109 assessments were collected. After the data were cleaned and screened for outliers, four of the surveys were excluded from further analysis due to incomplete data. A confirmatory factor analysis was first conducted on the hypothesized factor structure to determine the validity of each subscale. The sampling adequacy was evaluated using the Kaiser-Meyer-Olkin (KMO) measure and Bartlett’s Test of Sphericity on each of the constructs. Each construct with a KMO greater than 0.60 and a significant Bartlett’s Test of Sphericity ($p < 0.05$) was accepted as meeting the minimum requirements for sampling adequacy in order to perform validity and reliability analyses (Tabachnick & Fidell, 1996). Following the factor analysis, each subscale was subject to a Cronbach alpha reliability test. The Cronbach’s alpha for each subscale were as follows: 1) *Know Before You Go* – based on factor loadings, three of the five items were removed, $\alpha = .41$; 2) *Choose the Right Path* – based on factor loadings, three of the five items were removed, $\alpha = .56$; 3) *Trash Your Trash* – during the factor analysis all items held, $\alpha = .62$; 4) *Leave What You Find* – based on factor loadings one of the three items was removed, $\alpha = .40$; 5) *Be Careful With Fire* – during the factor analysis all items held, $\alpha = .54$; 6) *Respect Wildlife* – based on factor loadings, one of the three items was removed, $\alpha = .59$; 7) *Be Kind to Other Visitors* – based on factor loadings three of the five items were removed, $\alpha = .45$; and 8) *General feelings of Leave No Trace* – during the factor analysis all items held, $\alpha = .63$ (before item deletion). After deletion of the 12 items, a Principal Axis Factor analysis was performed using the remaining items. The results indicated the scale was unidimensional. After item deletion a Cronbach alpha of .77 was obtained for the scale (Miller, Brown, Hill, Shellman, & Gómez, 2010). Reliability coefficients for each subscale ranged from acceptable to low indicating that the scale needed to undergo a second revision. Based on these results, the PAS was updated for readability—rewriting the items to be understandable at the appropriate grade level subject to the Flesch-Kincaid (Kincaid, Fishburne, Rogers, & Chissom, 1975) grade-level readability test and revising each item to be more general to the public, rather than being camp specific. Some of the items were deleted and new items were added to ensure there were five items per principle and five items pertaining to general feelings about *Leave No Trace* and the environment. Five of the 40 items were reverse coded. The panel of education experts again reviewed the PAS, along with a fifth grade English teacher to ensure the items were appropriately written for that grade level.

The Second Scale

The second version of the PAS included 40 items. It was tested in the spring of 2011. During the second administration, fifth and sixth graders from a local elementary school were invited to participate in a day-long *PEAK* program at a local nature center. College students in an environmental and outdoor education course, who were trained in how to facilitate the *PEAK* activities, delivered the program

utilizing the teaching techniques outlined by *Leave No Trace*. Prior to attending the one-day field trip to the nature center, the fifth and sixth graders completed the PAS pre-test. The children completed the post-test following their participation in the *PEAK* program.

The 5-item Affinity for Nature (AN) Scale (Ellis & Sibthorp, 2006) was also administered during the post-test to assess convergent validity. The AN Scale was designed to measure retrospective change after participation in an environmental program. The AN Scale items were modified to be reflective of the one-day experience that took place at the nature center. For instance, the first item stated “I like being in nature,” and the second portion of the first item read “Is the above statement more or less true today than before you did the *PEAK* program?” which is the retrospective item.

Results

A total of 102 assessments were collected. After the pre-test and post-test assessments were matched and the data were cleaned and screened for outliers, a total of 71 matched and usable surveys were obtained for further analysis. Study participants ranged in age from 10 to 13 with a mean age of 11.27 years ($SD = .70$), and included 41 females (57%) and 30 males (42%).

Prior to exploring the data, a factor analysis with promax rotation was conducted to determine if the hypothesized eight factors (one for each of the seven principles and one for overall feelings about *Leave No Trace*) held. Results of the factor analysis indicated the scale was unidimensional. Sampling adequacy was evaluated using the Kaiser-Meyer Olkin (KMO) measure and Bartlett’s Test of Sphericity on each of the constructs. Each construct with a KMO greater than 0.60 and a significant Bartlett’s Test of Sphericity ($p < 0.05$) was accepted as meeting the minimum requirements for sampling adequacy in order to perform validity and reliability analyses (Tabachnick & Fidell, 1996). Further analyses to confirm if each of the items on the eight subscales held on the appropriate factor indicated a two-factor solution for four of the eight sub-scales. A Cronbach alpha was calculated for each subscale as a measure of reliability. George and Mallery (2003) provide the following guidelines for Cronbach alpha: “> .9 – Excellent, > .8 – Good, > .7 – Acceptable, > .6 – Questionable, > .5 – Poor, and < .5 – Unacceptable” (p. 231). After deletion of the unacceptable items, the Cronbach’s alpha reliability for each subscale fell between .61 and .77 (questionable to acceptable) and the Cronbach alpha for the entire scale was .94. The reported factor loadings (h) and alpha reliability assessment of the subscales for each principle can be seen in Table 1.

Table 1
PAS – Items by subscale after Validity and Reliability Checks

<i>Items</i>	<i>M</i>	<i>SD</i>	<i>h</i>
<i>Know Before You Go (KB, $\alpha = .62$)</i>			
It is important to plan before going on a trip.	3.66	.493	.75
If I go on long walks, I bring water.	3.68	.467	.70
<u>If I go outside, it is not important to tell someone where I am going.</u> ^{a b}			
When I play outside and its sunny, I wear sunscreen.	3.61	.553	.71
If it is cold outside, I try to dress for the weather.	3.27	.850	.63
<i>Choose the Right Path (CRP, $\alpha = .66$)</i>			
I try to stick to the path, even if it is muddy.	3.40	.702	.79
When I ride a bike, I stay on the correct path.	3.45	.722	.66
Sitting on rocks causes less impact than sitting on grass. ^b			
When I go for walks, I try not to step on flowers.	3.55	.559	.75
<u>If the sign says, “stay on the path,” I go off path anyway.</u> ^a	<u>3.56</u>	<u>.721</u>	<u>.65</u>
<i>Trash Your Trash (TT, $\alpha = .65$)</i>			
I try to leave places I visit better than I found them.	3.55	.580	.65
I bring my trash home if there is no trashcan.	3.46	.727	.68
It is important to clean up after your pet.	3.65	.579	.59
If I see a bottle, I will pick it up to recycle it.	3.42	.712	.82
<u>I leave my trash behind for others to clean up.</u> ^{a b}			
<i>Leave What You Find (LWF, $\alpha = .66$)</i>			
I leave flowers for others to enjoy.	3.50	.639	.78
If I find an arrowhead, I leave it for others to see.	3.24	.818	.71
I leave what I find so others can enjoy it.	3.46	.696	.78
<u>Carving in the bark of a tree does not harm the tree.</u> ^{a b}			
It is important to take care of historic places.	3.63	.639	.48
<i>Be Careful With Fire (BCF, $\alpha = .69$)</i>			
If my family goes camping, we use dead sticks from the ground to build fires.	3.57	.625	.63

I am careful with fire.	3.66	.552	.78
If using a fire, I put it out before I leave.	3.73	.570	.66
<u>If a sign reads, “do not build fires,” I do it anyway.</u> ^{a b}			
If I need to build a fire, I only do it when adults are around.	3.57	.636	.73
<i>Respect Wildlife (RW, $\alpha = .73$)</i>			
If I find a nest of baby birds, I watch it from a distance.	3.57	.661	.71
<u>If there is a sign that says, “do not feed the animals,” I do it anyway.</u> ^{a b}			
I respect wildlife.	3.68	.585	.64
If I find a nest of baby rabbits, I leave it alone.	3.60	.644	.72
I take pictures of wildlife to share with my family.	3.39	.742	.80
<i>Be Kind to Other Visitors (BK, $\alpha = .77$)</i>			
If there are other kids on the playground, I share the swing set.	3.53	.630	.76
I respect other visitors when I’m at the park.	3.69	.531	.83
If I go walking, I share the path with others.	3.58	.613	.69
<u>I do not like to share outdoor spaces with other people.</u> ^{a b}			
I am kind to other people.	3.57	.573	.73
<i>General Feelings about Leave No Trace (OA, $\alpha = .61$)</i>			
It’s important to take care of nature.	3.81	.397	.65
I will try to minimize impact on nature.	3.47	.735	.57
I do my best to make good decisions when visiting natural areas.	3.70	.459	.62
I want to share the <i>Leave No Trace</i> principles with my friends.	3.46	.661	.82
<u>It does not matter if I follow the <i>Leave No Trace</i> principles.</u> ^{a b}			

^a – reverse-coded item

^b - deleted in final scale

Know Before You Go. In the PAS, Know Before You Go was measured using five items. Initially, a factor analysis was performed. The Kaiser-Meyer-Olkin (KMO) measure of sampling was .69. Four of the five items had loadings sufficient to consider them as underlying measures of Know Before You Go, however item 17 (“If I go outside, it is not important to tell someone where I am going.”) exhibited a factor loading of .06 and was therefore excluded from the reliability analysis of the PAS. Subsequent reliability analysis of the Know before You Go subscale items resulted in a Cronbach’s alpha of 0.62, which was interpreted as questionable internal consistency. Consequent

deletion of any other item would not improve the scale reliability; thus the four items measuring Know Before You Go were retained.

Choose the Right Path. Initial confirmatory factor analysis of the five items intended to measure the CRP principle resulted in a KMO of 0.70 and a significant result of Bartlett's Test of Sphericity ($p=0.0001$). However, the factor loadings component matrix revealed two dimensions. Further analysis showed that item 18 ("Sitting on rocks causes less impact than sitting on grass.") loaded on the second dimension with 0.935. This item was removed during the reliability analysis. The test of reliability resulted in a Cronbach's alpha of 0.66.

Trash Your Trash. A KMO of 0.64 and a significant result of Bartlett's Test of Sphericity ($p=0.0001$) were obtained in the initial confirmatory factor analysis of the five items intended to measure the Trash Your Trash principle. The factor loadings component matrix revealed one dimension. Further analysis showed that item 19 ("I leave my trash behind for others to clean up") had a component matrix of 0.33. Even though this item did not fall on a second component, the reliability of the five Trash Your Trash items revealed a Cronbach's alpha of .61. After removal of item 36, the test of reliability resulted in an increase of the Cronbach's alpha to 0.65.

Leave What You Find. Initial confirmatory factor analysis of the five items intended to measure the Leave What You Find principle resulted in a KMO of 0.68 and a significant result of Bartlett's Test of Sphericity ($p=0.0001$). The factor loadings component matrix loaded on one dimension. Further analysis showed that item 28 ("Carving in the bark of a tree does not harm the tree.") had a component matrix of 0.349. Even though this item did not fall on a second component, the reliability of the five Leave What You Find items revealed a Cronbach's alpha of .61, but after removal of item 28, the test of reliability resulted in an increase of the Cronbach's alpha to 0.66.

Be Careful With Fire. In the initial confirmatory factor analysis of the five items intended to measure the Be Careful With Fire principle resulted in a KMO of 0.69 and a significant result of Bartlett's Test of Sphericity ($p=0.0001$). However, the factor loadings component matrix revealed two dimensions. Further analysis showed that item 22 ("If a sign reads, 'do not build fires,' I do it anyway.") loaded on a second dimension. This item was removed during the reliability analysis. The test of reliability resulted in a Cronbach's alpha of 0.69, an acceptable level of reliability.

Respect Wildlife. In the initial confirmatory factor analysis of the five items intended to measure the Respect Wildlife principle resulted in a KMO of 0.76 and a significant result of Bartlett's Test of Sphericity ($p=0.0001$). The factor loadings component matrix loaded on one dimension. The test of reliability resulted in a Cronbach's alpha of 0.74 indicating an acceptable reliability estimate.

Be Kind to Others. Initial confirmatory factor analysis of the five items intended to measure the Be Kind to Others principle resulted in a KMO of 0.773 and a significant result of Bartlett's Test of Sphericity ($p=0.0001$). Further analysis showed that item 31 ("I do not like to share outdoor spaces with other people.") had a component matrix of 0.528. Even though this item did not fall on a second component, the reliability of the five Be Kind to Others items revealed a Cronbach's alpha of .74, which is acceptable. After the removal of item 31, the test of reliability resulted in an increase of the Cronbach's alpha to 0.77.

Overall Feelings about *Leave No Trace*. Initial confirmatory factor analysis of the five items intended to measure the Overall Feelings about *Leave No Trace* resulted in a KMO of 0.63 and a significant result of Bartlett's Test of Sphericity ($p=0.0001$). Further analysis showed that items 16 and 40 ("I will try to minimize my impact on nature" and "It does not matter if I follow the Leave No Trace principles") exhibited factor loadings of 0.57 and 0.53 and were therefore originally excluded from the reliability analysis of the PAS. However, continued analysis indicated that when item 16 was removed, the Cronbach's alpha fell to .56, which was below the acceptable measure. When item 16 was included the Cronbach's alpha increased to 0.61.

In addition to Cronbach's alpha, the Average Variance Extracted (AVE) was used to assess validity-related evidence based on the sample scores. According to Ping (2005), Average Variance Extracted was proposed by Fornell and Larcker (1981) as a measure of the shared or common variance in a Latent Variable (LV), the amount of variance that is captured by the LV in relation to the amount of variance due to its measurement error (Dillon & Goldstein, 1984). Said otherwise, AVE is a measure of the error-free variance of a set of items. AVE is used to measure convergent validity, with values > 0.50 considered acceptable (Hair, Black, Babin, & Anderson, 2010). Concurrent validity was established by looking at the correlation between the PAS subscales. AVEs for all eight dimensions were found to be acceptable or near acceptable (between 0.45 and 0.50) with the following scores: 0.49 for Know Before You Go, 0.59 for Choose the Right Path, 0.49 for Trash Your Trash, 0.50 for Leave What You Find, 0.52 for Be Careful With Fire, 0.54 for Respect Wildlife, 0.59 for Be Kind to Other Visitors, and .47 for the overall measurement of *Leave No Trace*. Due to the exploratory nature of this study, the items that were found to be near acceptable (i.e., slightly lower than .50) were retained in the scale.

A Pearson Correlation was used to test for convergent validity between the PAS and Affinity for Nature Scale (AN). Results indicated no significant correlation between the two scales ($r = .199$). The lack of a significant correlation between the PAS and AN may be due to the fact that participants in the *PEAK* program may not necessarily increase their affinity for nature, but simply gain a better understanding of how to minimize their impact when recreating outdoors.

Discussion

The literature continues to reinforce the need for environmental education for children and adolescents (Blanchard & Buchanan, 2011; Hill & Goff, 2012). Furthermore, as environmental leadership becomes a regular part of our vocabulary, we must focus the experience and evaluate the effectiveness of programs designed to educate youth about environmental stewardship (Charles & Louv, 2009). Results of this study indicate that the 32-item *PEAK* Assessment Scale (PAS) has sound reliability and is an effective measure of the *PEAK* program. The data also indicate the PAS is a unidimensional measure and may best be used as an overall indicator of the effectiveness of the *PEAK* program. Unidimensionality may be due to the fact that many of the *Leave No Trace* principles operate on the ultimate principle of minimizing one's impact on the environment and, as such, are difficult to be individually parsed out. The lack of a significant correlation between the Affinity for Nature Scale and the PAS may not be that surprising given that some of the participants in this study verbalized that they "didn't like being outside." Hence, while youth may learn proper behaviors for minimizing their impact on the environment through the *PEAK* program, they may not necessarily develop an interest or "affinity" for nature, especially given the program in this study was conducted over a single day. It will likely take more than a one-day program exposing youth to nature to change their feelings towards the environment.

Implications for *Leave No Trace*

History shows that steady use of the outdoors can cause prolonged degradation to the natural environment (Leung & Marion, 2000; Marion & Reid, 2007). Through an examination of the literature on low-impact education programs, Marion and Reid (2007) concluded that the use of low-impact skills taught through *Leave No Trace* can help with changing user behaviors within protected areas. With the *No Child Inside Left Inside* movement promoting the use of the outdoors as a medium to reconnect children to nature, the findings of this study suggest the *PEAK* Assessment Scale is an effective tool to measure the success of *Leave No Trace's* *PEAK* program in teaching children the skills necessary to make responsible decisions when recreating in the out-of-doors. While not the purpose of this study, the *PEAK* program did demonstrate a positive effect at increasing children's knowledge of the *Leave Know Trace* principles and their understanding of the appropriate decisions and actions to take to follow those principles.

With *Leave No Trace* promoting hands-on opportunities and encouraging educators to get children outside to experience the content of the program, one of the tools beneficial to *Leave No Trace* is the ability to present educators with effective teaching techniques that incorporate constructivist learning theory and practice. Constructivist learning theory promotes active learning. Through effective active learning, participants' sense of care for the environment may be enhanced, ultimately leading to more pro-environmental behaviors (Eggen & Kauchak, 2004). Although behavior can be difficult to measure, future studies should try to assess the actual behaviors of participants, perhaps through direct observation.

Limitations

Limitations associated with the study include the use of a convenience sample, self-reporting, and a small sample size. By asking fifth and sixth graders to reveal personal behaviors or feelings about the *Leave No Trace* principles, the participants may have responded in what they believed to be a socially desirable manner, or in a way that they think they should, not what they actually think, do, or feel. With the PAS being administered in the classroom, children may strive for social desirability and want to answer the items based on what they think is right, not necessarily report what they feel or how they actually behave. Another issue with self-reporting includes the fact that participants in the *PEAK* program may not necessarily remember the material they learned, and simply circle something to avoid leaving an item blank.

Another factor that may have had an effect on this study is that participants did not come from a typical outdoor or educational program likely to use the *Leave No Trace* curriculum on a regular basis. For example, groups that would potentially use the *PEAK Pack* as a way to teach the *Leave No Trace* principles include Boy Scouts of America, Girl Scouts of the USA and other programs that bring children outdoors on a regular basis. Further, many of the children did not participate in camping or related activities, and hence lacked familiarity with some of the situations and terms presented in the *PEAK* program.

Conclusions and Recommendations

Results of this study indicate that the 32-item PAS is an effective instrument for *Leave No Trace* to assess the effectiveness of the *PEAK* program. It is recommended that an instructional guide be created to help *PEAK* educators properly administer the PAS. To ensure accurate collection of the data, it is recommended that *Leave No Trace* work closely with users of the *PEAK Pack* to ensure data is being collected in an effective manner. To facilitate the process and perhaps increase the likelihood the PAS is used, it is also suggested that the scale be placed in an online format for easy collection and storage of the data. Collection of the data through an online survey system would eliminate the need for data entry.

It is also recommended that *Leave No Trace* focus on what the word “impact” means to children in this age range and develop an activity to help children better understand what it means to have an impact on the environment. Based on feedback received from a 5th grade English teacher, she felt children within the target age range of this program may have struggled to understand what the word “impact” meant.

Finally, it is recommended that *Leave No Trace* focus on developing activities that are more front-country related. The majority of the children who participated in this study shared, either in writing or during the day-long event at the nature center, that they do not go outdoors frequently nor do they participate in camping related activities. The majority of the activities in the *PEAK Pack* are camping specific. With one of the goals of *Leave No Trace* being to reach a diverse group of children with the message of minimizing one’s environmental impact wherever one is engaged out-of-doors, it is important to develop curriculum that is relevant to the general population, not only children who already participate in outdoor activities such as camping and backpacking.

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Appendix

PEAK Assessment Scale (PAS)

Know Before You Go	
kb1	It is important to plan before going on a trip.
kb9	If I go on long walks, I bring water.
kb25	When I play outside and its sunny, I wear sunscreen.
kb33	If it is cold outside, I try to dress for the weather.
Choose the Right Path	
crp2	I try to stick to the path, even if it is muddy.
crp10	When I ride a bike, I stay on the correct path.
crp26	When I go for walks, I try not to step on flowers.
crp34	If the sign says, "stay on path," I go off path anyway.
Trash Your Trash	
tt3	I try to leave places I visit better than I found them.
tt11	I bring my trash home if there is no trashcan.
tt19	It is important to clean up after your pet.
tt27	If I see a bottle, I will pick it up to recycle it.
Leave What You Find	
lwf4	I leave flowers for others to enjoy.
lwf12	If I find an arrowhead, I leave it for others to see.
lwf20	I leave what I find so others can enjoy it.
lwf35	It is important to take care of historic places.
Be Careful with Fire	
bcf5	If my family goes camping, we use dead sticks from the ground to build fires.
bcf13	I am careful with fire.
bcf21	If using a fire, I put it out before I leave.
bcf29	If I need to build a fire, I only do it when adults are around.
Respect Wildlife	
rw6	If I find a nest of baby birds, I watch it from a distance.
rw39	I take pictures of wildlife to share with my family.
rw30	I respect wildlife.
rw37	If I find a nest of baby rabbits, I leave it alone.
Be Kind to Others	
bk7	If there are other kids on the playground, I share the swing set.
bk15	I respect other visitors when I'm at the park.
bk23	If go walking, I share the path with others.
bk38	I am kind to other people.
General LNT Concepts	
overall8	It's important to take care of nature.
overall16	I will try to minimize my impact on nature.
overall24	I do my best to make good decisions when visiting natural areas.
overall32	I want to share the <i>Leave No Trace</i> Principles with my friends.