

Original Research Paper

Adolescent Internal Environmental Locus of Control Scale (AINELOC) Measurement Tool

Carnell Colebrook-Claude

School of Psychology, Fielding Graduate University, Santa Barbara, CA, USA

Article history

Received: 02-12-2018

Revised: 17-03-2019

Accepted: 23-04-2019

Email: carneycac@yahoo.com

Abstract: This study aims to validate the Adolescent Internal Environmental Locus of Control (AINELOC) scales (green consumer, activist, advocate and recycling attitude). The AINELOC was used to identify the association between internal locus of control and pro-environmental behaviors in adolescents. The study was conducted because of the lack of data in the literature about the subject matter and developed based on the deficiency of applicability in the original Internal Environmental Locus of Control (INELOC) scale to the adolescent population. This opportunity to adjust the language to make it more accessible for adolescents resulted in the construction of the AINELOC tool to research adolescents' reasoning and innate ability to make interpretations about beliefs and motivations regarding the environment. It was demonstrated that persons with greater levels of internal environmental locus of control have positive mindsets and beliefs that affect their well-being, behavior and attitude toward the environment. Collectively, the literature in this research explored the role of LOC as a driving factor and a strong predictor in shaping an individual's eco-centric thoughts and behavior. The factor structure of the AINELOC was examined and data collected from a sample of adolescents to validate the internal consistency of scales for this novel construct. Correlations between the Multidimensional Health Locus of Control (MHLOC) measure with the new AINELOC tool were conducted to provide substantiation for the convergent and discriminant validity of the AINELOC.

Keywords: AINELOC, INELOC, MHLOC, Adolescent, Locus of Control, Validity

Introduction

The purpose of this study is to validate a new measure, the Adolescent Internal Environmental Locus of Control Scale (AINELOC), which captures the distinctiveness of an adolescent's internal dimension of locus of control in an environmental context. The AINELOC scales were developed drawing from the framework of Cleveland *et al.* (2012) original construct, Internal Environmental Locus Of Control (INELOC) which was inspired by social learning theory (SLT), a theory developed by Julian B. Rotter to try and explain motive and behavior (Rotter, 1954). Rotter's SLT formed the theory of locus of control (Rotter, 1954). Locus Of Control (LOC) expresses that the potential for behavior or a set of fundamentally associated behaviors to occur in each psychological circumstance is a

combined function of personal expectations that the behavior(s) will lead to a specific reinforcement and the value of that reinforcement holds for the person in that situation. Rotter's (1966) results revealed that a person who has strong beliefs that he/she can control his/her own fate is expected to (a) be more attentive to those facets of the environment which provide useful information for his/her future behavior; (b) take steps to improve his/her environmental condition; (c) place more value on talent or achievement strengthening and generally be more worried with his/her aptitude, especially his/her failures; and (d) be resistive to subtle efforts to manipulate him/her (Rotter, 1966). In turn he/she develops a generalized expectancy of control when support is perceived as conditional on his or her behavior. Behaviors that result in support help to reinforce a person's perception of control (Atibuni *et al.*, 2017).

The causes of several environmental problems present a threat to environmental sustainability, including urban air pollution, demise of biodiversity, global warming, environmental noise and water deficiencies. Most of these problems are caused by direct or indirect remiss human behavior and can be managed by altering the related behavior to lessen its environmental impact (Steg and Vlek, 2009). Accordingly, it brings about the opinion that changing one's behaviors may lead to anticipated outcomes and thus, provides incentive for a person to change his or her behavior (Ahn *et al.*, 2014).

Individuals with a strong internal locus of control believe that they are the rulers of their destiny and are often self-assured in trying to control their external environments (Ng *et al.*, 2006). They believe that their actions can bring about change and are more likely to have positive attitudes towards natural environment. Even though attitudes do not control behavior directly, they do influence behavioral intentions which in turn affects a person's actions. Thus, persons with strong pro-environmental attitudes are generally more likely to participate in pro-environmental behavior (Kollmuss and Agyeman, 2002). Alternatively, when strengthening of underlying environmental attitude fails to occur, the generalized expectancy will lessen or extinguish.

It is vital to uncover a person's internality by identifying the relations between locus of control and pro environmental attitudes by developing a more thorough understanding of what motivates or inhibits pro-environmental behavior. The Internal Environmental Locus of Control (INELOC) measure reveals the individual belief of a person about his or her pro-environmental intentions and behavior. It captures an individual's intricate mindset relating to personal responsibility regarding his or her ability to influence the condition and well-being of the environment (Cleveland *et al.*, 2012). However, INELOC is not entirely appropriate for adolescents because the population studied was a sample of only adult consumers.

As a result, this research seeks to explore this same concept of locus of control as it relates to pro environmental behavior centered specifically on adolescents with at least an eight-grade reading level, resulting in the development of the AINELOC, which uncovers an adolescent's pro-environmental mentality. The AINELOC factors were constructed utilizing the Internal Environmental Locus of Control (INELOC) questionnaire as a foundation and were further revised with language clearly understood by adolescents since the INELOC was constructed and validated using an adult population.

Adolescence is a critical developmental period where the individual's understanding of the world around him or her depends on social, economic, cultural, physical and biological factors. Specific changes in personality

and cognition occur such as increased moral sensitivity due to more abstract thinking abilities, better perspective-taking skills and more knowledge about societal dilemmas like the environment (Krettenauer, 2017). An adolescent's expectations about him/herself in relation to his or her environment strongly influences his/her behavior. Consequently, it is important to determine an adolescent's locus of control to progress development of his or her environmental attitudes where necessary (Atibuni *et al.*, 2017).

The AINELOC can identify an adolescent with a strong association between internality (LOC) and environmental concerns. When made aware, the adolescent can be encouraged to embrace environmental activism and take appropriate actions to implement changes within his or her home and community to generate significant changes that can progressively influence the environment and quality of life for all (Kollmuss and Agyeman, 2002). Hence, the research question, does the AINELOC depict an adolescent's attitude and beliefs concerning his or her behavior toward the environment?

Review of the Literature

Locus of Control

Locus of control is an expectancy theory. For example, the less external or more internal a person's belief aligns, the more he or she expects reinforcement after his or her behavior. However, according to Rotter, low externality or high internality scores must exclusively project behavior probability under circumstances where the outcome or reinforcement is valued. Rotter's (1954) basic premise is that the component to consider in the study of personality is the interaction of the individual and his or her meaningful environment. The Internal-External (I-E) Scale (Rotter, 1966) was constructed grounded on these hypothesized characteristics and of the kinds of behaviors and situations that are significant for this study. According to social learning theory, "internals" are more likely to take steps to better their environmental condition than "externals" would (Rotter *et al.*, 1972).

The articles in this research investigated the role of internal locus of control (LOC) on individuals' beliefs, attitudes, behaviors, health and the environment. Locus of control is often used in survey research to predict such intricate phenomena as social commitment, political participation, unemployment, vocational behavior, well-being or health issues and many other factors. Research (Rotter, 1966; Kollmuss and Agyeman, 2002; Sarigollu and Huang, 2011) suggests that LOC defines a personal belief about whether outcomes of behavior are determined by an individual's actions or by forces outside of a person's control. This personality trait has

often been shown to have an impact on human behavior across a broad spectrum of social situations. The reviewed literature shows the development of scales such as the Internal External Scales (Wallston *et al.*, 1978), the Health Locus Scale (HLC; Wallston *et al.*, 1978) and the Multidimensional Health Locus of Control Scales (MHLOC; Wallston *et al.*, 1978).

Health Locus of Control

Wallston *et al.* (1976a) theorized that there is a link between internal orientation and health behaviors. That is, persons with internal locus of control beliefs value health because they attribute their health to their own actions and highly expose themselves to more information about a given health condition. Grounded on this hypothesis, Wallston *et al.* developed the Health Locus of Control (HLC) Scale, an area-specific measure of expectancies concerning locus of control, to predict health-related behavior. Two studies (Wallston *et al.*, 1976a) were conducted in which participants were categorized independently as Internals or Externals (I or E) on both the HLC and I-E scales. Both scales assessed individuals' locus of control beliefs. The first study, completed by 44 male and 44 female volunteer college students from a small southern university, was a booklet of instruments, with background information about the subjects' previous experiences with high blood pressure, the HLC and I-E scales and a measure of the significance that the participants placed on health. The second study, a pre-experimental test battery that included the HLC and I-E scales, was administered to 34 overweight females with an average age of 21, who were either students or employees at two small private Southern colleges (Wallston *et al.*, 1976a).

The results of the studies showed that there was a marginally significant interaction between health value and HLC classification (internals and externals) and no such interaction between health value and I-E classification. Wallston *et al.* (1976a), found that consistent with the hypothesized prediction, when the Health Locus of Control Scale is used as the basis for classification (internals and externals), persons with an internal locus of control, who highly valued health, tended to seek more information than other individuals (externals).

Wallston and Wallston (1978) reviewed data from previously conducted studies, to determine the connection between locus of control and several health behaviors. The authors found that in addition to locus of control displaying promise in predicting and clarifying specific health-related behaviors, such as getting information about a specific health condition, taking medication as prescribed, or maintaining appointments, there is proof that the locus of control construct is relevant to the prediction of both health behaviors and

sick-role behaviors. According to the authors, persons who believe that reinforcement is primarily internal were more inclined to participate in ways that facilitate a healthier and fitter physical well-being. Wallston and Wallston established that individuals who are internal were more likely to engage in behaviors which are self-initiated and serve to maintain or improve one's level of personal wellness.

Similarly, Wallston *et al.* (1978) constructed and defined the MHLOC scales. The authors conducted a scale development study, in which persons over the age of 16 were approached in a metropolitan airport and asked to complete a survey. A statement of the purpose of the scale development study and four demographic questions: Sex, age, place of residence and educational level were included in the booklet. The average age of the participants was 42 years. The outcome revealed that the MHLOC scales (Internal Health Locus of Control [IHLC], Powerful Others Health Locus of Control [PHLC] and Chance Health Locus of Control [CHLC]) assessed more than one aspect of health locus of control, which increases the likelihood of understanding and predicting health behaviors such as losing weight or smoking cessation (Wallston *et al.*, 1978). The authors also indicated that only in interaction with one or more of a multitude of contributing factors will beliefs in health locus of control play a significant role in explaining health behaviors. Wallston *et al.* suggest that utilizing the MHLOC scales is a more efficient way of assessing health locus of control, than the original unidimensional health locus of control scale developed by Wallston *et al.* (1976b) since the MHLOC predicts an individual's patterns and or behaviors that enhance his or her health more accurately (Wallston *et al.*, 1978).

Wallston (1982) discussed the importance of internal health locus of control on an individual's behavior. The author articulated that health locus of control refers to the belief a person has about who or what determines the state of his or her health. According to Wallston, an individual is said to have an internal health locus of control if he or she contemplates that his or her actions affect whether he or she remains healthy, becomes ill, or recuperates from a sickness. The author also stated that persons with internal health locus of control have the greatest potential for behaving in a health-enhancing manner because a person's internal health locus of control beliefs ultimately affect his or her well-being. Wallston and Wallston (1982) offer support for their HLOC construct, establishing expected correlations with each subscale. The results indicate that higher levels of IHLC correlate with more active involvement in health care treatment and better physical and mental health.

In summary, the literature suggests that in the health care context locus of control theory indicates that internals would adopt a greater sense of responsibility for their own health outcomes and would choose a more

active role in the service encounter (Atibuni *et al.*, 2017). Researchers have agreed that in recent decades internal locus of control has been connected to positive health beliefs and behaviors. Hence, internals are more likely to engage in hands-on health promotion behaviors such as disease prevention (capacity to stop smoking, capacity to lose weight, getting precautionary immunizations), illness management (compliance to a medical régime), or successful execution of potential health actions (wearing seat belts, successful use of birth control, getting regular dentist checkups) and seek out more health-related information than externals.

Environmental Locus of Control

According to Ahn *et al.* (2014), as the original locus of control scale is an evaluation of a general insight of control over life occurrences, tools for determining apparent locus of control particularly in the milieu of environmental behaviors have also been successfully validated, such as the Environmental Locus of Control (ELOC), developed by Cleveland *et al.* (2005). The ELOC embodies persons' beliefs whether the nature-related circumstances they are dealing with are caused by themselves (internally) or from others (external) and the internal environmental locus of control explains the degree to which individuals believe that they can affect (pro-environmental) outcome through their actions (Uddin and Khan, 2018).

Internal locus of control is one of the strongest predictors of environmental behaviors because it influences an individual's environmental attitude and in turn, the behavioral responses of people. Persons with an internal locus of control are inclined to be more concerned about the environment and have attitudes which support environmental responsibility. For this reason, they are more likely to engage in activities to protect the environment (Sarigollu and Huang, 2011). Schultz and Oskamp (1996) designed three studies to examine the role of effort in the link between pro-environmental attitudes and pro-environmental behavior. However, only two of the studies measured the actual behavior of the participants. In their first study the authors measured the extent to which people consider humans to be an essential component of nature and measured recycling with both a behavioral measure for one set of students and a self-report measure for all participants. The results showed a positive association between environmental concern and both behavioral and self-reported measures of recycling and environmental concern highly correlated with recycling in surroundings that demanded a moderately high amount of effort.

Schultz and Oskamp's (1996) second study was administered to 104 volunteer undergraduates enrolled in introductory psychology. The authors examined the self-reported behaviors when incentives were offered and in hypothetical situations that varied as to the amount of

effort required in recycling behaviors. An individual's attitude influences the connection between environmental concern and recycling behavior, so the third study was a meta-analysis of various studies on the association between environmental concern and recycling. Schultz and Oskamp (1996) examined existing literature on recycling using meta-analytic methods to further investigate the link between effort, recycling and environmental concern. The recycling procedure of each literature was considered as either "curbside or drop off." The results showed that research conducted in the high-effort drop off recycling programs revealed a stronger association with persons having more environmental concerns and ensuing recycling behavior than those in studies carried out in low-effort curbside recycling agenda.

The overall results of the three studies (Schultz and Oskamp, 1996) revealed that attitudes of general environmental concern are linked positively with a high effort of participation in environmental behavior such as recycling. A pro-environmental attitude would cause an individual to become knowledgeable about environmental realities and concerns and develop respect for their natural surroundings. According to Aguilar *et al.* (2008), an individual with a high environmental locus of control results in him or her having confidence in his/her ability to affect change and act responsibly concerning environmental problems, together with becoming more inclined to be environmentally preemptive. Also, individuals' concern for the environment is strongly related to the amount of effort respondents were willing to spend on environmental behavior such as recycling (Schultz and Oskamp 1996). Schultz and Oskamp's study further proposed that pro-environmental attitudes that influence behaviors and effort are an important variable in the attitude-behavior relationship which suggests that recycling behavior is related to both attitudes and the recycling context and effort is a moderator between attitudes and behaviors.

McCarty and Shrum (2001) also articulated that locus of control influenced beliefs and environmental behaviors. Their study investigates the influence of fundamental value orientations assessed at the individual level (individualism, collectivism and locus of control) and of economic status on environmental beliefs and behavior. McCarty and Shrum provided information about how individuality, collectivism, locus of control and economic status may shape recycling behavior when aided by the recycling beliefs about importance and inconvenience. The data gathered for this study came from persons in communities where curbside recycling was available. It was found that for individuals with more internal locus of control, beliefs around the importance of undertaking

proenvironmental behaviors, such as recycling, for example, are linked to the tendency of that behavior. According to McCarty and Shrum (2001), a person with high internal locus of control believes that he or she has substantial influence over his or her life and that his or her actions affect specific outcomes.

Similarly, Cleveland *et al.* (2005) postulate that people with high internal Locus Of Control (LOC) believe that they influence the outcome of environmental situations. Cleveland *et al.* (2005) measured various attitudinal and personality variables related to Environmental Locus Of Control (ELOC), which captures consumers' multifaceted attitudes about personal responsibility towards and ability to affect environmental outcomes. The goal was to investigate the connections between ELOC and a broad range of environmental behaviors, using several items intended to measure persons' control over pro-environmental outcomes. The research examined the impact of various attitudes and personality characteristics on environmentally friendly behaviors, from a Locus Of Control (LOC) perspective. Specifically, a model linking a related construct, Environmental Locus Of Control (ELOC), to a series of pro-environmental behaviors was developed and tested.

The authors measured environmental locus of control using a sequence of items intended to measure participants' perceived control over a number of pro-environmental outcomes. Cleveland *et al.* (2005) discovered four different dimensions of ELOC, two of which correlated to an external LOC -- "biospheric altruism" and "corporate skepticism," and the other two correlated to an internal LOC -- "economic motivation" and "individual recycling efforts" (Cleveland *et al.*, 2005, p. 202). They then connected these four dimensions to several pro-environmental behaviors. Highly variable models were revealed, with unrelated dimensions supposing a greater or lesser influence, or no part at all, contingent upon the specific behavior being analyzed.

Their outcome revealed the significance of considering the specificity of pro-environmental behaviors when evaluating the antecedent roles of pro-environmental attitudes/ temperaments, which are in and of themselves, intricate and multidimensional. For example, avoidance of detergents containing phosphates and of Styrofoam cups are behaviors and primarily a function of biospheric-altruism, whereas other behaviors, like responsible automobile usage patterns, tended to be determined by economic motivation. It highlights that attitudinal variables are much better forecasters of a person's tendency to participate in Pro-Environmental Behaviors (PEB) than demographic variables. The authors conveyed that investigation into the connection between locus of control and PEB showed a positive relationship between a

person's level of locus of control and recycling and economic motivational behaviors (Cleveland *et al.*, 2005).

Internal Environmental Locus of Control

Though like the ELOC, according to Cleveland *et al.* (2012), internal locus of control is also a leading determinant in people's attitude towards the environment. Based on these assumptions Cleveland *et al.* developed the INELOC as a new construct, to encapsulate the many aspects of people's attitudes regarding subjective obligation with regards to and capacity to influence environmental outcomes. Cleveland *et al.* (2012) posited that INELOC (Table 1, Cleveland *et al.*, 2012) was significant as a predictor of various behaviors and is divided into four dimensions: Green Consumer, Activism, Advocate and Recycling Attitudes.

Adhering to the domain-sampling paradigms of Nunnally and Bernstein (1967) and Churchill (1979), Exploratory Factor Analysis (EFA) (using SPSS, principal components extraction and direct oblimin rotation) was done on the 84 Likert-scale attitudinal items to decrease the data into a more significant set of factors (Cleveland *et al.*, 2012). After many replications, as presented in Table 1, satisfactory factor solution developed and these factors revealed high measures of internal consistency. In consideration of their respective composite items (Table 1), the factors were categorized as follows: *Green Consumer* (3 items), *Activist* (5 items), *Advocate* (4 items) and *Recycler* (4 items). The psychometric properties of the items retained from the EFA were then reevaluated with two (2) more rigorous Confirmatory Factor Analysis (CFA) procedures for error and model identification purposes (Cleveland *et al.*, 2012). As expected, based on the earlier EFA reliability analyses, the squared multiple correlations were highly satisfactory: Green Consumer ($r^2 = 0.62$), Activist ($r^2 = 0.60$), Advocate ($r^2 = 0.51$) and Recycler ($r^2 = 0.34$). The model produced acceptable fit properties, with all standardized regression path coefficients to the first-order factors being very significant and fluctuated from a low of 0.58 to a high of 0.79 (Cleveland *et al.*, 2012). Convergent and discriminant validity of INELOC's first-order dimensions were then evaluated and substantiated the theoretical difference between its latent constructs.

The essential quality or characteristics of the attitude-behavior interaction varied significantly across behavioral contexts, suggesting that persons do not always act in a proenvironmental way. The primary objective of Cleveland *et al.*'s research was to report on the construction of a new concept, Internal Environmental Locus of Control (INELOC) that encapsulates the many aspects of people's attitudes regarding personal duty towards and power to influence environmental outcomes. An example of

this is a person's beliefs regarding his or her powers (internal locus of control) as the leading psychological mechanism that directs or determines the state of the environment. The linkages between INELOC and a broad range of environmental behaviors were investigated. The researchers' (Cleveland *et al.*, 2012) inquiry supported the emerging consensus that attitudinal variables are more powerful predictors of an individual's tendency to undertake pro-environmental behaviors (PEBs) than accepted typical demographic indicators.

Being significant in the overwhelming number of cases (i.e., 47 out of 50), INELOC was demonstrated to be a powerful predictor of pro environmental behaviors. In each case when the relationship was significant, it was positively related; signifying that higher levels of the INELOC are associated with higher frequencies of pro environmental behaviors

(Cleveland *et al.*, 2012). According to Cleveland *et al.* (2012), EFA and CFA disclosed four first-order dimensions such as green consumer, advocate, activist and recycling attitudes. Structural equations modeling procedures indicated that INELOC was a strong positive predictor of many behaviors.

The consensus of the data gathered from the literature in this research confirmed that individuals with high levels of internal locus of control have positive attitudes and beliefs about what causes their actions that affect behavior, health and environmental practices. Internal locus of control is a motivating factor and a powerful predictor in determining cognitions and functions (McCarty and Shrum, 2001). Due to its link to education, general health, overall life satisfaction and other relevant variables of social research issues, it is interesting not only for psychological but also for sociological research questions.

Table 1: Internal Environmental Locus of Control (INELOC): Exploratory and Confirmatory Factor Analyses (EFA and CFA)

Factors/ Items ^a	EFA (SPSS) ^b	CFA (AMOS) ^{c,d}
<i>Green Consumer</i>	$\alpha = 0.78$	$r^2 = 0.62$
q136 The sooner consumers start buying greener products, the sooner companies will transform to respond to their demands.	0.92	0.69
q175 The more I buy 'green' products, the more I help persuade companies to become 'friendlier' to the environment.	0.73	0.77
q66 By buying greener products, I can make a difference in helping the environment.	0.64	0.74
<i>Activist</i>	$\alpha = 0.89$	$r^2 = 0.60$
q17 Any donation to environmental groups such as Greenpeace helps it attain its goals.	0.91	0.82
q18 The efforts deployed by environmental groups (such as Greenpeace) have an impact on the end result of many ecological challenges.	0.87	0.75
q165 By making donations to pro-environmental groups (such as Greenpeace), I can help make a positive difference on the state of the environment.	0.80	0.84
q56 By giving money to environmental groups, I help increase their probability of success.	0.80	0.76
q134 Pro-environmental groups make a difference in fighting local environmental issues.	0.68	0.73
<i>Advocate</i>	$\alpha = 0.87$	$r^2 = 0.51$
q152 I am able to convince a friend to change his/her conservation habits.	0.86	0.95
q131 I am able to convince some of my friends to take some kind of action with regards to environmental challenges.	0.83	0.87
q45 If willing, people can generally influence their friends' transportation habits.	0.81	0.71
q50 To some degree, I can influence my colleagues' choice between carpooling, taking the bus, or driving their car to work.	0.79	0.62
<i>Recycler</i>	$\alpha = 0.78$	$r^2 = 0.34$
q22 By recycling, I am helping to reduce pollution.	0.86	0.83
q170 By recycling, I am doing my part to help the state of the environment.	0.80	0.60
q32 The more paper I recycle, the more trees I save.	0.69	0.68
q6 By recycling, I am saving valuable natural resources.	0.65	0.70

Note: ^aAll items measured on 7-point scales (1 = strongly disagree, 7 = strongly agree), ^bThe second column provides reliability statistics (Cronbach's alphas) and individual item-factor loadings, ^cConfirmatory factor analysis results pertain to the four-factor correlated model and ^dThe third column provides the explanatory power of combined observable items on the latent factors (squared multiple correlations: r^2) and standardized regression weights (λ 's, all statistically significant at $p < 0.001$). Reprinted from "It's not Easy Being Green": Exploring Green Creeds, Green Deeds and Internal Environmental Locus of Control," by M. Cleveland, M. Kalamas and M. Laroche, 2012, *Psychology and Marketing*, 29, p. 298. Copyright © 2012 by John Wiley & Sons, Inc. or related companies. All rights reserved. Reprinted with permission.

Adolescent Internal Environmental Locus of Control Factors

The INELOC was effective in positively predicting pro environmental behaviors by capturing adult consumer awareness and attitudes concerning the environment, however, the characteristics of the sample used (i.e., adult consumers near a major, urban Canadian university) not only place limits on generalizing the findings, but it is also not appropriate for an adolescent population. The goal of this research was to develop a novel scale which has desirable reliability and validity properties to evaluate an adolescent's internal locus of control regarding the environment for use with a teen/adolescent population, ranging in age from 13 to 17-year-olds with an eighth-grade reading level (Churchill, 1979).

Adolescents have much to contribute to environmental matters so understanding their environmentally responsible attitude is vital because it furthers theory progression associated with developing ways and means to encourage pro-environmental behavior (Sawitri *et al.*, 2015). Adolescence is a vulnerable period when social forces and socialization help form identities which influence ideals, attitudes and behaviors throughout life. Therefore, an adolescent's environmental mindset is worthy of attention because he or she is the future of ecological stewardship and sustainability (Wray-Lake *et al.*, 2009). The multidimensional concept of AINELOC expressed proposes a potential method for explaining and identifying adolescents with a pro-environmental attitude. So, using the Internal Environmental Locus of Control (INELOC) questionnaire as a point of reference the AINELOC was constructed with language more easily understood by adolescents, which was done using a small focus group of teenagers to translate the items of the questionnaire. A Flesch-Kincaid readability statistics analysis was also conducted to provide a score of readability and showed the questionnaire at an eighth-grade reading level. This method was used because it has exceptional reproducibility and a high correlation in relation to other readability tools. The average reading age of the United States population is the eighth-grade (13-14 years old) and a Flesch readability of 60 or more is regarded as well written and easy to follow (Williamson and Martin, 2010).

Cleveland *et al.* (2012) manuscript the authors examined the relationship between strong personal attitudes towards protecting the environment and actual pro-environmental behaviors in four different dimensions. They found that a high internal locus of control for the environment, which they developed a questionnaire to measure, significantly predicted whether consumers would report if they would engage in behaviors such as making environmentally friendly purchases, recycling and inspiring friends and family to conserve natural resources. The sample of individuals that Cleveland *et al.* used were adults ages 18 and over.

Given the information access of today's youth, we were interested in replicating the study with a group of adolescents. The first step, however, was to adapt the Internal Environmental Locus Of Control (INELOC) questionnaire to language more easily understood by adolescents, which was done using a small focus group of teenagers to translate the items of the questionnaire. The items which measure attitudes towards being a Green Consumer, Activist, Advocate and Recycler (Cleveland *et al.*, 2012), were transformed to be teen/adolescent friendly, resulting in the construction of an Adolescent Internal Environmental Locus Of Control (AINELOC) questionnaire. The factors green consumer, activist, advocate and recycling attitudes examined the internal side of an adolescent locus of control and suggested several categories of environmental attitudes ("green consumer," "activism," "advocate," and "recycling attitudes") indicating outcomes that at least in part are the result of adolescents' consumers' volitions.

The AINELOC was also created to tap into an adolescent's cognitive and internal ability to make inferences about beliefs and motivations in regards to their pro environmental attitudes and behavior. Additionally, the factors (green consumer, activist, advocate and recycling attitudes) of the AINELOC and scales of the AINELOC have been developed to capture adolescents' attitudes regarding personal responsibility and ability to have an influence on environmental outcomes and to assess the adolescents' attitudes relating to personal obligation vis-à-vis to influence environmental outcomes. The Cleveland *et al.* research applied data collected from a sample of consumers near a major urban university in Canada. Cleveland *et al.* a well-established measurement method, was used to create a new measure to assess the AINELOC construct.

Statement of the Problem

Purpose of the Study

Locus of control is shaped during childhood and becomes stable during adolescence; and it is determined by various experiences the person goes through including societal influence, culture, age, sex, religion and training (Atibuni *et al.*, 2017). This research evaluated an adolescent's internal and core understanding of ecology and environmental conservation as an area-specific measure of probabilities concerning locus of control developed for prediction of environmental related behavior. It sought to measure an adolescent's diverse areas of functioning (e.g., emotional, behavioral and environmental) and assist the environmentalist in creating possible strategies encouraging adolescents to adopt and adapt to environmentally friendly behaviors such as recycling attitudes, green consumer, advocacy and activism that influence positive health and psychological well-being. Once validated the AINELOC would be used to increase not only the adolescent's level of

environmental concern but furthermore, his or her recognition of personal accountability for the condition of the environment and subsequently, his/her capability to make a difference (Cleveland *et al.*, 2012).

The purposive sampling technique places limitations on the generalizability of findings to the broader population. Due to the nature of the subject and the adolescent's self-reporting of environmental attitudes and behaviors, it is impractical to ignore the probability of socially desirable response styles (Cleveland *et al.*, 2012). Cross-sectional survey data restricts conclusive establishment of true cause-and-effect associations. It is important to validate the AINELOC with other samples from diverse populations and to confirm the scale's predictive validity of pro-environmental behaviors together with other, adolescent friendly locus of control instruments (Cleveland *et al.*, 2012).

To establish the measure the present study determined convergent and discriminant validity between two internal measures of constructs *adolescent environmental internal locus of control* and *multidimensional health internal locus of control* (AINELOC and MHLOC; Wallston *et al.*, 1978). Theoretically, the internal measures of these constructs (the AINELOC -- recycling attitudes, green consumer, advocacy and activism; the MHLOC -- internal health locus of control, powerful others health locus of control and chance health locus of control; Wallston, 2005). These scales are related via specific variables accurately measuring the given construct in order to show nomological validity. These two constructs were measured to assess the extent to which scores on the AINELOC correlated with or were related to scores on the MHLOC that were designed to evaluate the same concept (internal locus of control). The extent to which the scores on AINELOC were related to scores collected from MHLOC were defined. Discriminant validity was established between the AINELOC and measures of the MHLOC external scales (Powerful Others Health Locus of Control and Chance Health Locus of Control; Wallston, 2005). To show that the AINELOC factors do not relate to the external factors, such that it was possible to discriminate between these constructs if there were no or small correlations between the AINELOC and measures of the MHLOC external scales. Also, a confirmatory factor analysis with the AINELOC was completed to assist in confirming its four components.

Research Question

What is the relationship between (a) AINELOC and (b) MHLOC? The AINELOC depicted construct validity and reliability regarding an adolescent's attitude and beliefs concerning his or her behavior toward the environment. The research tested the hypothesis which is the validation of the AINELOC with a sample of adolescents ($n = 402$). To that end, psychometric validity was anticipated via a correlation matrix for all variables. It was expected that the four factors of the new

AINELOC measure would correlate positively (moderate to high) with the MHLOC internal scale as both measures deal with internal structures with individuals at an eighth-grade reading level. Additionally, correlations of the AINELOC factors would be very low when compared to the correlations with the external factors of the MHLOC measure as the internal variables should not appear to be significantly related to external variables.

Hypotheses

The hypotheses to address the preceding research question are as follows:

- H-1: Confirmatory factor analysis of the AINELOC will result in a four-factor structure, consisting of recycling attitudes, green consumer, advocacy and activism.
- H-2: The four subscales of the AINELOC will be significantly positively correlated with the MHLOC internal subscale.
- H-3: The correlations of the four subscales of the AINELOC with the MHLOC internal scales will be greater than the correlations with the external scales of the MHLOC to support discriminant validity.

Methodology

This section defines the research design, participants, recruitment procedures, measures and statistical analysis.

Measurement Method

This research project utilized a group design self-report survey method approach. An analysis was conducted to test for confirmatory factor analysis with the AINELOC and convergent and discriminant validity with the MHLOC. Confirmatory factor analysis was performed to test the AINELOC to find out if the same factor structure would emerge between the new tool AINELOC and the MHLOC. Following the principles for conducting quantitative research procedures outlined by Byrne (2001) the four facets of AINELOC are hypothesized to be theoretical concepts that cannot be witnessed nor measured directly, but instead, displayed through observable indicator variables (Cleveland *et al.*, 2012). Convergent validity with the AINELOC and the MHLOC internality scale was made to examine the correlation between these two subscales to confirm that the measures of constructs which hypothetically should be correlated with each other are related. Discriminate validity between the AINELOC and the MHLOC powerful others scale and the MHLOC chance scale was established and demonstrated that measures of constructs that hypothetically should not be correlated with each other are not related. This was assessed based on the criteria of explanatory power (common variance), as specified in Fornell and Larcker (1981). The common

variation is that the Average Variance Extracted (AVE) of every latent construct ought to be above 0.50 and that the squared correlation between any two latent variables ought to be less than either of their individual AVEs (Fornell and Larcker, 1981). This technique offered an evaluation of both the statistical and operational (practical) significance of the AINELOC.

Participants

The population of interest for this study were all teen/adolescents (aged 13-17 years) residing within the continental United States with at least an eighth-grade reading level. A self-report demographic information form was used to collect data, including age, grade level, gender and ethnicity. Participants were recruited and questionnaires were administered via Qualtrics, an online survey platform. Prior to taking the survey, valid informed consent and assents were obtained from all research participants and their legally authorized representatives.

Exclusion Criterion

Adolescents who are not, at least, within the eighth grade. The question "What grade are you in?" was included on the demographic information form. Participants were excluded in cases when they answered any number other than 8, 9, 10, 11, or 12 in response to this question. Information concerning the participants recruited for this research study are specified in the Results section.

Instruments

Demographic data were gathered on age, grade level, gender and ethnicity.

Condition-Specific Locus of Control

For all participants, the AINELOC was administered. The AINELOC is a 16-item questionnaire, divided into four sections: Green shopper, activist, advocate and recycler. I developed the new measure to specifically extract adolescents' opinions and views concerning the environment, consistent with the elements realized in a review of the Cleveland *et al.* (2012) environmental literature/research. This included multiple items for measuring aspects associated with an internal environmental locus of control that is, everyday green actions, efforts to influence environmentally friendly outcomes efforts. The AINELOC, intended to be used with adolescents, was measured on a 6-point Likert scale ranging from 1 = *strongly disagree* to 6 = *strongly agree* (Table 2). The 6-point Likert scale was used as the measurement scaling process to coincide with the MHLOC.

Other Measures of Locus of Control

The MHLOC was designed to be used with individuals who function at an eighth-grade reading level

with no functional impairments. It has three six-question subscales which are measured on a 6-point Likert scale where 1 = *strongly disagree* and 6 = *strongly agree*. The MHLOC three subscales measure internal and external locus of control health-related beliefs by measuring a person's dispositional principles as to whether his or her cherished outcomes resulted from his/her own behavior or persevering qualities (an internal LOC orientation), or to external influences such as other individuals, fate, luck, or chance (Wallston, 2013). For this study, all three subscales, Internal Health Locus of Control (IHLC); (e.g., "I have the power to make myself well"), Powerful Others Health Locus of Control (PHLC); (e.g., "Health professionals keep me healthy") and Chance Health Locus of Control (CHLC); (e.g., "No matter what I do, if I am going to get sick, I will get sick") were administered to determine convergent and discriminant validity with the AINELOC (Egan *et al.*, 2009). I hypothesized that the AINELOC subscales would significantly positively correlate with the MHLOC internal subscale and would have no or small correlations with the MHLOC external subscales.

Procedures

An online questionnaire was created and distributed to teen/adolescents randomly selected via Qualtrics, web-based survey platform. The participants and their parents were informed that the purpose of the research was to evaluate an adolescent's personal beliefs about caring for the environment and his or her genuine pro-environmental attitudes. Only after the parent/guardian gave informed consent and the adolescents agreed to contribute, were the instructions provided. The participants were made aware that completing the survey was entirely voluntary and that refusal or removal from the study resulted in no consequence or loss, now or in their immediate future. All answers were confidential and the personal data collected were completely anonymous, saved in a protected file only accessible by the researcher. They were also informed that there were no right or wrong replies and all responses should be based on their present circumstances and opinions.

After each participant completed and submitted the survey, they were acknowledged and thanked for contributing to the important research project. A debriefing statement was included at the very end of survey administration explaining that the purpose of the research was to test the new locus of control measure (i.e., AINELOC), designed specifically for adolescents to evaluate their internal personal outlook towards caring for the environment and genuine pro-environmental perceptions and actions in four diverse dimensions. Additionally, they were apprised that the information collected throughout the study could be used for further or subsequent research.

Table 2: Adolescent Internal Environmental Locus of Control (AINELOC) Questionnaire

	SD	MD	D	A	MA	SA
Green Consumer						
Q5 If you want greener businesses, buy greener products.	1	2	3	4	5	6
Q6 The more green products I buy, the more I influence businesses to be more “eco-friendly.”	1	2	3	4	5	6
Q7 By buying greener products, I can make a difference in helping the environment.	1	2	3	4	5	6
Activism						
Q8 Even a few spare dollars will help environmentally friendly groups reach their goals.	1	2	3	4	5	6
Q9 Hard working environmental groups may have a huge impact on our ecosystems.	1	2	3	4	5	6
Q10 By giving a few spare dollars to environmental groups, I can make a positive change.	1	2	3	4	5	6
Q11 By giving money to environmental groups, I help increase their chance to succeed.	1	2	3	4	5	6
Q12 Environmentally friendly groups make a difference in fighting environmental issues in your community.	1	2	3	4	5	6
Advocate						
Q13 I am able to teach my friends about having an eco-friendly lifestyle.	1	2	3	4	5	6
Q14 I am able to convince my friends about actions they could take concerning environmental issues.	1	2	3	4	5	6
Q15 If they want to people can usually influence the kind of transportation their friends and families use.	1	2	3	4	5	6
Q16 In some cases, I can change my friend’s family or my family to either carpool, take the bus, or drive their own car.	1	2	3	4	5	6
Recycling Attitudes						
Q17 By recycling, I am helping to decrease pollution.	1	2	3	4	5	6
Q18 By recycling, I am doing my part to help the environment.	1	2	3	4	5	6
Q19 Recycling paper saves trees.	1	2	3	4	5	6
Q20 By recycling, I am saving precious natural resources.	1	2	3	4	5	6

1 = STRONGLY DISAGREE (SD); 2 = MODERATELY DISAGREE (MD); 3 = SLIGHTLY DISAGREE (D); 4 = SLIGHTLY AGREE (A); 5 = MODERATELY AGREE (MA); 6 = STRONGLY AGREE (SA)

Sample Size Estimation

This research was a factor analytic study so selecting a sample size was centered on the minimum required sample size to obtain reliable results from the statistical processes conducted (Pearson and Mundform, 2010). Correlation coefficients tend to be less consistent when approximated from small samples, so more is better. It is imperative that sample size be big enough that correlations are consistently estimated. The required sample size also was contingent on the magnitude of the population correlations and number of factors; if there are strong correlations and limited, distinct factors, a lesser sample size would have been acceptable (Tabachnick and Fidell, 2013). Comrey and Lee (1992) provided a guide for sample sizes showing a sample size of 50 as very poor, 100 as poor, 200 as fair, 300 as good, 500 as very good and 1,000 as excellent. As a rule of thumb, for this study, it was essential to attain a sample size of approximately 300 for factor analysis in order to obtain valid assumptions about the factor structure of the AINELOC.

Data Analysis

EFA was done to explore the structure of the four factors of the AINELOC and CFA were completed to validate that the structures work. For EFA, using SPSS, the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy and Bartlett’s test of sphericity (BTS) was employed to validate that the correlation matrix was suitable to construct a factor structure not found by chance and to confirm that the data are workable to being factor

analyzed by using principal components extraction and oblique rotation (to permit the probable occurrence of distinct, yet correlated factors); (Cleveland *et al.*, 2012).

To test for CFA the psychometric properties of the items obtained from the EFA were then reexamined with the more rigorous CFA method, using the maximum probability fitting process in the AMOS 16.0 software program (Arbuckle and Wothke, 1999). In this succession of analyses, the four facets of the AINELOC were speculated to be theoretical constructs that cannot be observed nor measured directly, but rather, manifested through observable indicator variables.

An analysis was performed to determine convergent and discriminant validity between the AINELOC and the MHLOC internal and external scales developed by Wallston *et al.* (1978). The first-order dimensions were evaluated using the standards identified by Fornell and Larcker (1981). That is, the Average Variance Extracted (AVE) of each latent construct ought to be above 0.50 and that the squared correlation between any two latent variables ought to be less than either of their individual AVEs (Cleveland *et al.*, 2012).

Results

This section reviews sample characteristics, descriptive statistics, validities and the results.

Sample Characteristics

The sample contained a total of 401 participants. The average participant age was 15.17 years ($SD = 1.45$) and

average grade level was 9.61 ($SD = 1.63$). The sample was roughly equal in gender with 203 males (51%) and 198 females (49%). Most of the participants reported being White (281; 70%). For other reported races, there were 63 Black or African Americans (16%), 24 Asians (6%), 25 Other (6%), 4 American Indian or Alaska Native (1%) and 4 Native Hawaiian or Pacific Islander (1%) (Table 3).

Confirmatory Factor Analysis

Means, standard deviations and correlations for the items in the AINELOC scale are presented in Table 4. A Confirmatory Factor Analysis (CFA) was conducted on the items to test the hypothesized four-factor model. The CFA was conducted using maximum likelihood estimation in SPSS AMOS statistical software. Model fit was evaluated based on cutoff recommendations (Hu and Bentler, 1999; Schreiber *et al.*, 2006).

A one-factor model was first evaluated to serve as a baseline comparison. The one-factor model was an acceptable fit to the data, $\chi^2(104) = 1273.50, p < 0.001, AIC = 1337.50, CFI = 0.78, RMSEA = 0.17$ (90% CI = [0.16, 0.18]). The four-factor was then evaluated and found to have good fit, $\chi^2(98) = 310.68, p < 0.001, AIC = 386.68, CFI = 0.96, RMSEA = 0.07$ (90% CI = [0.07, 0.08]). The four-factor model had significantly better fit when compared to the one-factor model, $\chi^2(6) = 962.82, p < 0.001$.

Modification indices were evaluated for the four-factor model to determine if model fit could be improved.

The modification indices suggested allowing the errors to covary between “If they want to people can usually influence the kind of transportation their friends and families use” and “In some cases, I can change my friend’s family or my family to either carpool, take the bus, or drive their own car” would improve model fit ($\Delta\chi^2 = 46.35$). Modification indices then suggested that allowing errors between “Recycling paper saves trees” and “by recycling, I am saving precious natural

resources” to covary would improve model fit ($\Delta\chi^2 = 44.62$). After these correlated errors were added, the four-factor model had even better fit to the data, $\chi^2(96) = 200.56, p < 0.001, AIC = 280.56, CFI = 0.98, RMSEA = 0.05$ (90% CI = [0.04, 0.06]). Table 5 shows the model fit statistics for each of the models. Figure 1 presents the final four-factor model with standardized estimates.

The four-factor model was further evaluated for discriminant validity among the four scales using standards identified by Fornell and Larcker (1981). The scales were examined to ensure the Average Variance Extracted (AVE) for each latent construct was above 0.50 and greater than its maximum shared variance (MSV). The AVE for variables were all adequate with AVEs of 0.630 for green consumer, 0.740 for activism, 0.631 for advocate and 0.733 for recycling attitudes. The AVE was higher than the MSV for the activism factor and they were similar for green consumer factor. Examining the correlations, the higher MSV values were likely due to the strong relationships with activism and both green consumer and recycling attitudes composite reliability estimates were all high for the latent factors with 0.93 for green consumer, 0.84 for activism, 0.87 for advocate and 0.92 for recycling attitudes (Table 7).

Table 3: Sample demographics

Demographics	M	SD
Age	15.17	1.45
Grade Level	9.61	1.63
Gender Proportions		
Male	51%	
Female	49%	
Race Proportions		
White	70%	
Black/African American	16%	
Asians	6%	
American Indian or Alaska Native	1%	
Native Hawaiian or Pacific Islander	1%	
Other	6%	

Table 4: Descriptive Statistics for AINELOC Items

M	SD	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1. Green Consumer Q1	4.51	1.25															
2. Green Consumer Q2	4.49	1.23	0.62**														
3. Green Consumer Q3	4.79	1.24	0.58**	0.70**													
4. Activism Q1	4.53	1.24	0.51**	0.64**	0.69**												
5. Activism Q2	4.62	1.26	0.47**	0.59**	0.66**	0.75**											
6. Activism Q3	4.58	1.26	0.49**	0.59**	0.65**	0.79**	0.76**										
7. Activism Q4	4.48	1.28	0.50**	0.62**	0.66**	0.74**	0.71**	0.76**									
8. Activism Q5	4.51	1.24	0.50**	0.59**	0.62**	0.71**	0.69**	0.74**	0.70**								
9. Advocate Q1	4.09	1.33	0.45**	0.47**	0.42**	0.49**	0.52**	0.52**	0.55**	0.57**							
10. Advocate Q2	4.07	1.35	0.48**	0.53**	0.52**	0.54**	0.53**	0.55**	0.58**	0.55**	0.80**						
11. Advocate Q3	3.96	1.38	0.35**	0.41**	0.44**	0.48**	0.41**	0.47**	0.55**	0.52**	0.57**	0.61**					
12. Advocate Q4	3.79	1.42	0.28**	0.43**	0.39**	0.46**	0.46**	0.46**	0.48**	0.51**	0.60**	0.61**	0.67**				
13. Recycling Attitude Q1	4.95	1.22	0.50**	0.55**	0.65**	0.59**	0.56**	0.54**	0.54**	0.57**	0.46**	0.47**	0.38**	0.36**			
14. Recycling Attitude Q2	4.98	1.19	0.50**	0.58**	0.66**	0.60**	0.59**	0.57**	0.59**	0.58**	0.47**	0.47**	0.37**	0.37**	0.81**		
15. Recycling Attitude Q3	4.96	1.29	0.45**	0.54**	0.61**	0.49**	0.50**	0.47**	0.52**	0.55**	0.38**	0.38**	0.33**	0.28**	0.66**	0.73**	
16. Recycling Attitude Q4	4.96	1.23	0.52**	0.0**	0.67**	0.5**	0.56**	0.4**	0.59**	0.1**	0.46**	0.6**	0.38**	0.5**	0.72**	0.7**	0.81**

** $p < 0.01$

Table 5: Fit statistics for measurement models

Model	χ^2	df	p	AIC	CFI	RMSEA	90% CI
One-factor	1273.50	104	<0.001	1337.50	0.78	0.17	[0.16, 0.18]
Four-factor	310.68	98	<0.001	386.68	0.96	0.07	[0.07, 0.08]
Four-factor with CE	200.56	96	<0.001	280.56	0.98	0.05	[0.04, 0.06]

Note: CE = Correlated Errors

Table 6: AINELOC items

Factor	Item	M	SD
Green	If you want greener businesses, buy greener products.	4.51	1.25
Consumer ($\alpha = 0.84$)	The more green products I buy, the more I influence businesses to be more “eco-friendly.” By buying greener products, I can make a difference in helping the environment.	4.49 4.79	1.23 1.24
Activism ($\alpha = 0.93$)	Even a few spare dollars will help environmentally friendly groups reach their goals. Hard working environmental groups may have a huge impact on our ecosystems. By giving a few spare dollars to environmental groups, I can make a positive change. By giving money to environmental groups, I help increase their chance to succeed.	4.53 4.62 4.58 4.48	1.24 1.26 1.26 1.28
Advocate ($\alpha = 0.88$)	Environmentally friendly groups make a difference in fighting environmental issues in your community. I am able to teach my friends about having an eco-friendly lifestyle. I am able to convince my friends about actions they could take concerning environmental issues. If they want to people can usually influence the kind of transportation their friends and families use.	4.51 4.09 4.07 3.96	1.24 1.33 1.35 1.38
Recycling attitudes ($\alpha = 0.92$)	In some cases, I can change my friend’s family or my family to either carpool, take the bus, or drive their own car. By recycling, I am helping to decrease pollution. By recycling, I am doing my part to help the environment. Recycling paper saves trees. By recycling, I am saving precious natural resources.	3.79 4.95 4.98 4.96 4.96	1.42 1.22 1.19 1.29 1.23

Table 7: Validity Statistics for AINELOC Factors

	CR	AVE	MSV	1	2	3	4
1. Green Consumer	0.93	0.74	0.75				
2. Activism	0.84	0.63	0.75	0.87			
3. Advocate	0.87	0.63	0.51	0.72	0.67		
4. Recycling Attitudes	0.92	0.73	0.69	0.75	0.83	0.58	

Note. CR = Composite Reliability, AVE = Average Variance Extracted, MSV = Maximum Shared Variance

Table 8: Descriptive Statistics for Factors within AINELOC and MHLOC Scales

Variable	M	SD	1	2	3	4	5	6	7
1. Green Consumer	13.78	3.23	(0.84)						
2. Activism	22.73	5.57	0.76**	(0.93)					
3. Advocate	15.90	4.68	0.58**	0.67**	(0.88)				
4. Recycling Attitudes	19.85	4.45	0.73**	0.69**	0.51**	(0.92)			
5. IHLC	24.13	5.40	0.42**	0.45**	0.47**	0.39**	(0.81)		
6. PHLC	23.35	5.74	0.41**	0.47**	0.54**	0.42**	0.56**	(0.83)	
7. CHLC	21.29	5.80	0.18**	0.22**	0.24**	0.18**	0.22**	0.46**	(0.79)

The value enclosed in parentheses represents Cronbach’s alpha coefficient; ** $p < 0.01$

Discriminant Validity of the AINELOC

The AINELOC scales were examined in relation to the MHLOC scales (Wallston *et al.*, 1978) to evaluate discriminant validity. Table 8 shows the descriptive statistics for the AINELOC and MHLOC scales. Reliability was assessed using Cronbach’s alpha. For the AINELOC scale, factors were found to be moderately or strongly correlated to each other ($r = 0.51-0.76$). When compared to the MHLOC factors, small to modest correlations were found ($r = 0.18-0.54$). Modest correlations were found for all AINELOC factors with the IHLC and PHLC factors. Small

correlations were found for all AINELOC factors and the CHLC factor. The MHLOC scales had strongest correlations to the AINELOC’s advocate factors. For IHLC, correlations ranged from 0.39 for recycling attitudes to 0.47 for advocate. For PHLC, correlations ranged from 0.41 for green consumer to 0.54 for advocate. For CHLC, correlations ranged from 0.18 for green consumer and recycling attitudes to 0.24 for advocate. The larger size of correlations among factors within the AINELOC scale compared to the size of correlations with factors in the MHLOC scale supports discriminant validity. That is, the AINELOC scale measures something distinct from the MHLOC scale.

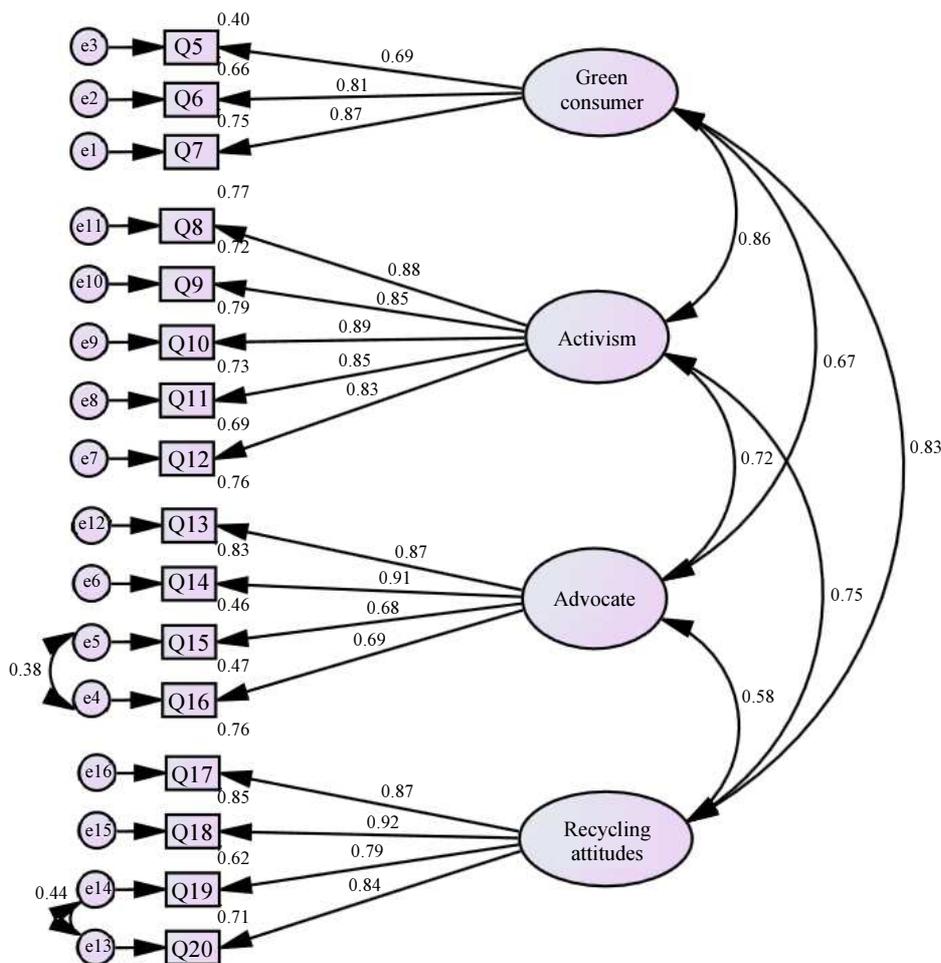


Fig. 1: Final measurement model with standardized estimates

Summary of Findings

The purpose of these analyses was to evaluate the four-factor model of the AINELOC scale. A four-factor model was supported based on the examinations of absolute fit and relative fit compared to a one-factor model, but the single factor solution is still acceptable. The reliability of the AINELOC factors were found to all be high. There were some problems with the uniqueness of each factor based on strong intercorrelations among them. In particular, activism was strongly correlated to both green consumer and recycling attitudes. Evidence for discriminant validity was found for the AINELOC factors based on a comparison to the MHLOC factors. Overall, the findings of the analysis were supportive of the four-factor model for the AINELOC scale.

Discussion

Purpose of the Study

This research analyzed and found support for the four-factor structure of the 16-item Adolescent Internal

Environmental Locus of Control (AINELOC) measure. The AINELOC assess four areas aimed at helping researchers distinguish the domains of pro-environmental behaviors. The four dimensions measuring adolescents' pro-environmental attitudes and behaviors are green consumer, activist, advocate and recycling attitude. This study reports the development and validation process for the AINELOC. The tool was field tested with data gathered from 401 randomly selected adolescent contributors recruited online. This research study was important because it measured environmental characteristics in adolescents that have been neglected in other environmental constructs thus far. The four-factor AINELOC measure demonstrated good model fit statistics, substantial factor loadings, strong reliability and discriminant validity when compared to the MHLOC scales.

Inspired by the Internal Environmental Locus of Control (INELOC) measure, the AINELOC is a concise, self-report assessment tool developed specifically to explore whether locus of control regulates the influence of pro-environmental attitude on pro-environmental

behavior, or locus of control predicts a mixture of pro-environmental attitudes and behaviors directly in adolescents. This study is among the first to validate an adolescent measure of environmental locus of control, thereby filling an important gap in the empirical clinical literature on adolescents' environmental mindsets. The core objective of this project was to construct an empirically and socially valid assessment tool to reveal variables that drive adolescents to take on pro-environmental behaviors by analyzing the role locus of control plays in environmental attitudes and beliefs. Locus of control corresponds to an adolescent's perceptions of his or her ability to cause environmental change through personal behavior (Ugulu *et al.*, 2013). Individuals with internal locus of control are generally more inclined towards stronger pro-environmental behaviors and take more interest in environmental concerns making them excellent students to develop into active representatives of environmental protection (Ando *et al.*, 2010).

The environment has become a grave concern due to ever-increasing issues linked to acid rains, weakening of the ozone layer and dilapidation of the land and many more importunate environmental issues (Cherian and Jacob, 2012). Environmental protection and restoration are some of the major challenges faced by our society. To address this problem, it is fundamental to understand pro-environmental behaviors in the population, as well as the factors that determine them. To improve the number of and extent to which individuals participate in pro-environmental behaviors, it is essential to increase not only people's levels of environmental understanding, but moreover, their recognition of personal responsibility for the existing state of the environment and consequently, their ability to make a difference (Cleveland *et al.*, 2012).

Environmental degradation is one of the most severe threats faced by countries making it an obvious social and political concern. Environmental safeguard measures and restoration efforts rely a great deal on the everyday choices made by individuals. How humans behave toward the environment, what they consume, or what they are willing to give up are a fundamental part of truly understanding and addressing environmental deterioration (Bronfman *et al.*, 2015). To tackle this problem, it is important to understand pro-environmental behaviors in the population, along with the factors that influence them.

As environmental concerns have escalated, interest in understanding the psychological bases of pro-environmental behavior has grown immensely (Kormos and Gifford, 2014). However, studies concerning pro-environmental behavior in adolescents are rare and there is a dearth of empirical information about adolescents' environmental mentality. The result is a critical need for valid and reliable tools created to measure adolescents' pro-environmental attitudes.

Measuring environmental mindsets during adolescence is of great interest because to provide a healthy and reliable environment for the next generations, it is important to be able to identify environmentally conscious persons (Yorek *et al.*, 2010). This study advances current literature by expanding the measurement of adolescents' multidimensional attitudes concerning their individual responsibility towards and capacity to affect environmental outcomes. It specifically focuses on adolescents because it is crucial for scholars to care about today's adolescents' environmental attitudes, beliefs and behaviors, as they are tomorrow's pioneers tasked with the responsibility of caring for the environment. Adolescents have a lot to contribute to environmental problems and do not get the attention they should from environmental researchers (Wray-Lake *et al.*, 2010). The AINELOC was developed to address this disparity and provide insight into environmental way of thinking during adolescence, a vital developmental phase which has important insinuations for physical, mental and environmental advancement and wellbeing.

Exploratory factor analysis was utilized to decide whether the hypothesized dimensions between the observed variables and underlying factors were mirrored in the collected data. It should, however, be noted that even with exploratory factor analysis, theory remains an important standard to determine which items to keep and which items to remove (Henson and Roberts, 2006). The psychometric properties of the AINELOC were examined using principal component analysis extraction, to uncover any latent variables that cause the manifest variables to covary and given that factor analysis only examines shared variance, it should produce the same result (all other things being the same) while also obviating the inflation of estimates of variance represented (Costello and Osborne, 2005). Direct oblimin rotation was also performed to clarify the factor structures and a series of reliability assessments to investigate the consistency and reveal any correlation between the factors.

Based on an eigenvalue cutoff of 1.0, factor analysis identified a total of two factors explaining 68.10% of the total variance. The EFA outcomes for the two-factor model indicate that all survey items load strongly onto the first factor. The second factor had moderate loadings for the advocate survey items and negative loadings for the recycling attitude items.

A second EFA was conducted forcing the model to a four-factor solution. The four-factor model explained a total of 78.49% of the total variance. The EFA outcomes for the four-factor model indicate that all survey items load strongly onto the first factor. The second factor had moderate loadings for the advocate survey items and negative loadings for the recycling attitude items. The third factor had negative loadings for three of the five activism items. The fourth factor had loadings on two of the three green consumer items. The factor loadings of

the items related to each of the four factors were satisfactory. The variance explained by the factor loadings was greater than 50% for many of the items, which is like data explained in earlier studies assessing the reliability and construct validity of assessment tools using the same type of evaluation (e.g., INELOC). The overall confirmatory factor analyses supported the predicted four-factor structure and the correlation of the dimensions. More specifically, the confirmation of the four-dimensional structure across the data offers assurance in the duplication of its structure in future studies.

Using the psychometric properties of the items obtained from the EFA, the 16-item AINELOC was then evaluated using a more rigorous Confirmatory Factor Analysis (CFA) method to assess the factor structure. Two models were tested to define the relations between the visible indicators and the four unobservable underlying constructs. The one-factor model was based on the PCA and the hypothesized four-factor solution. The four-factor model was based on the theoretical foundation of AINELOC and correlating errors within factors based on the modification indices. To assess the goodness-of-fit of the model the AMOS 16.0 software program using the maximum probability fitting process and several other fit indicators were applied, including the adjusted chi-square ($\chi^2/\text{degrees of freedom}$) test, the Comparative fit Index (CFI) and the root mean squared error of approximation (RMSEA). As expected, using the base of the earlier EFA consistency analyses, the squared multiple correlations were very satisfactory.

The model fit indices presented in Table 5 reveal that the one-factor model was not a good fit to the data compared to the hypothesized model. Predictably, the four-factor model produced a better fit. All items displayed good factor loadings on their equivalent hypothesized factors and all parameter estimations were discovered to be statistically significant. The correlations between factors in the four-factor model were strong: $\chi^2(98) = 310.68$, $p < 0.001$, $AIC = 386.68$, $CFI = 0.96$, $RMSEA = 0.07$ (90% CI = [0.07, 0.08]), making this model representing the positive component of the AINELOC theoretically preferred. Following standard factor retention principles, model fit and interpretability, results from the CFA verified that the 16 items corresponded with the 4 subscales that are fundamental to the hypothesized model. The items loaded well onto their respective factors with good overall model fit, resulting in the 4-factor CFA solution being selected as the most suitable model for the 16-item tool.

As a multidimensional construct the AINELOC is made up of different facets. For this reason, it was anticipated that the four first-order factors identified in the prior steps could be clarified by some higher order factor structure (i.e., the second-order AINELOC factor). Therefore, a higher order CFA was performed with further regression paths (and residual terms and variance

constraints, for error and model identification rationales, respectively) joining the second-order construct to the initial first-order constructs and once again produced satisfactory fit properties (Cleveland *et al.*, 2012).

The convergent and discriminant validity of the AINELOC's first-order dimensions was tested to measure the extent of its correlation with the MHLOC. The correlation coefficients between the subscales and total weighted scores on the AINELOC and the MHLOC were figured using standards identified by Fornell and Larcker (1981). These assessments verified the theoretical distinction within these latent constructs making AINELOC a second-order construct comprised of four interrelated yet diverse dimensions: Green Consumer, Activist, Advocate and Recycler (Cleveland *et al.*, 2012). This evidence suggests that adolescent environmental state of mind calls for further research as a key indicator for understanding and predicting important pro environmental behaviors of persons with valid and reliable scales.

Results of the Analysis

The Adolescent Internal Environmental Locus of Control (AINELOC) is a valid and reliable instrument in identifying an adolescent's pro-environmental intentions and behavior. Solid evidence shows that the AINELOC has construct validity and adequate internal consistency. Confirmatory factor analysis indicated that the AINELOC, like the INELOC, can easily be separated into four diverse dimensions: Green Consumer, Activism, Advocate and Recycling Attitudes. These factors differentially influence behaviors, contingent on the specific conditions (Cleveland *et al.*, 2012). These factors represent key areas of pro environmental behaviors that can stand alone as valid subscale scores, or the measure can be summarized by an overall score.

Psychographic methods-specifically, the multifaceted conceptualization of the AINELOC offers optimistic avenues to understand the environmental values, interests and habits of adolescents (Cleveland *et al.*, 2012). Taking into consideration the diversity of behaviors included in this study, the findings regularly showed positive relationships between the AINELOC and adolescents' pro-environmental perceptions and actions.

Strengths and Weaknesses

This research is fundamentally quantitative therefore it was cost effective and had a short time frame between administering the AINELOC questionnaire to the adolescent population of interest and collection of the detailed, numerical and reliable data. Also, its reliability can be critically evaluated which can assist in understanding the multifaceted relationships between lots of different variables. Through calculating the strength of the relationships between the four factors of the AINELOC variables validation was

attained and allows researchers to make predictions including pro-environmental tendencies while distinguishing the domains of pro-environmental behaviors. Nevertheless, discretion is considered necessary regarding the type of the supporting research because their reported findings are founded using correlational studies. Undoubtedly, these are authentic research methods; however, thoughtfulness must take place as not to have measurement and misspecification predispositions and imply a relationship between variables which show a substantial correlation.

Study Limitations

Although efforts were made to ensure a strong research design, this study still comes with limitations. First, the research topic and self-reported measurements may have led participants to respond in a socially desirable way. Second, a single sample was used, which limits the generalizability of this study. The amount of sample included in this research has validated conclusions; however, expanding the research to a more diverse population will better affirm the conclusion. For that reason, it is important to authenticate the current scale with other adolescent samples obtained from varied populations. Despite these limitations, the strengths of this study include the sample size, high response rate, sound psychometric validation, consistency with other environmentalist attitude scales and a focus on adolescents.

Suggestions for Future Research

This study represents an initial step in investigating pro-environmental attitudes and behavior in adolescents. The AINELOC can be a valuable tool for assessing the ability of environmental education programs to promote positive changes in adolescents' environmental beliefs. Through understanding the variables that influence pro-environmental behaviors, programs offering environmental education opportunities can augment specific attitudes held by adolescents toward the environment and foster their interest to safeguard it as they develop long-term conservation ethics.

It should be acknowledged that there are several future exploration directions including research on how environmental factors can be used to enhance the psychological wellbeing of adolescents. Also, it is possible to create new dimensions to innovate the field of study as further exploration of External LOC, (i.e., measures for adolescents on EXELOC) can be performed. Likewise, other dimension divisions and additional items can be generated for the AINELOC to assure at minimum 6-7 items per dimension and questions rearticulated if needed to adequately cover the domain of the concept. Additionally, research can be done to corroborate an adult as well as the adolescent sample frame. Independent studies can be carried out as preliminary studies to validate the scale's predictive

validity with numerous outcome variables, for example, pro-environmental behaviors, alongside other and established pro-environmental attitude measures. Supplementary questions could be added to the present scale to find out if reliability would be enhanced and it may also be advantageous to compare reliability based on test-retest comparisons. Either way, the present AINELOC scale provides a practical instrument to continue the advancement of our knowledge of adolescents' pro-environmental convictions.

Another direction is further refinement of the AINELOC to be less socially desirable, thus generating more variance in the item responses and reducing ceiling effects. Further testing of the scale is necessary to assess the cut-off values for adequate knowledge of adolescent pro-environmental attitudes and behaviors. Researchers could also explore additional validation of the scales using larger numbers of adolescents from more diverse populations (i.e., different languages, social classes and cultural backgrounds across various locations) which would help improve the generalizability of the AINELOC.

Conclusion

In conclusion, the AINELOC is a psychological measurement/assessment tool to ascertain adolescents' multifaceted notions of ecological attributions and responsibilities for bringing about pro environmental changes. A pro-environmental behavior construct, the AINELOC, captures an adolescent's internal temperament related to environmentally responsible behavior, an area lacking in data. AINELOC was developed for prediction of environmental related behavior which is essential for current environmental developments needed to protect the environment for future generations. Its findings are significant to environmental research because by evaluating an adolescent's locus of control researchers can understand environmental concern and determine an individual's environmental intention and behaviors earlier in order to improve environmental sustainability and quality of life for generations to come. Accordingly, it is a promising tool for researchers to explore adolescents' attitudes towards the environment. The AINELOC is a valid and reliable instrument in identifying an adolescent's pro-environmental intentions and behavior. Confirmatory factor analyses confirmed that the AINELOC can be separated into four factors: Green consumer, activism, advocate and recycling attitudes. These factors represent key areas of pro-environmental attitudes and behaviors that can be evaluated by factor scores or as an overall AINELOC score. The AINELOC can be used by scholars to evaluate an adolescent's environmental state of mind, which can be applied to inform evidence-based strategies and programs to enhance pro-environmental actions.

Acknowledgement

Special thanks to Dr. Mark Cleveland who gave his permission to use the INELOC and provided invaluable comments and suggestions which improved this manuscript, my faculty mentor Dr. Anthony Greene, who backed this theory from the very beginning and was influential in the AINELOC's development, Dr. April Harris-Britt for her support and irreplaceable counsel and Dr. James Vivian for sharing his expertise.

Funding Information

This research did not receive any specific grant from funding organizations in the public, commercial, or not-for-profit sectors. This paper was prepared without any funding source.

Ethics

There are no ethical issues associated with this research as all the participants remain anonymous and contributed data/information in complete awareness of what the research was about.

Conflict of Interest

The author declares no conflict of interest.

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