EFFECTS OF ENVIRONMENTAL EDUCATION PROGRAMMING ON STUDENT-ATHLETES' ENVIRONMENTAL AND ACADEMIC ORIENTATIONS

by

LAUREN ELIZABETH MULLENBACH

(Under the Direction of Gary T. Green)

ABSTRACT

The pursuit of environmental literacy is typically undertaken through environmental education. Environmental literacy is critical for today's generation of university students, yet is sometimes not within reach of all students. Student-athletes, many of whom are at-risk academically, often miss opportunities to achieve environmental literacy. Therefore, this study sought to close the gap between student-athletes and environmental knowledge and skills. Student-athletes participated in environmental education through the Athletic Association mentoring program. Environmental attitudes, behaviors, and knowledge, self-efficacy, self-regulatory learning, motivation, and use of learning strategies were measured in a pretest-posttest survey developed by the researchers. Cronbach's alpha reliability coefficients for each scale were above 0.7, and all item loadings were above 0.5. Independent samples t-tests revealed increases in environmental behaviors ($t(32) = 2.34$, $p = 0.03$), self-efficacy ($t(32) = 2.07$, $p = 0.04$), and environmental attitudes ($t(32) = 1.83$, $p = 0.07$). Future research examining differences between groups and with other programs, such as tutoring, is recommended.

INDEX WORDS: Environmental attitudes, Environmental behaviors, Environmental education, Learning outcomes, Mentoring, Student-athletes

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CHAPTER 1

INTRODUCTION AND LITERATURE REVIEW

A generation of young people today faces a future with many complicated, global issues, the solutions to which will require skills and resources provided by a sound education (Kopnina, 2014; O'Brien et al., 2013). The rise of these issues occurs after a decades-long shift in focus on sustainable development within environmental education, which has moved away from nature-based interactions to issues in the public sphere (Kopnina, 2014). Efforts to correct the paucity of interactions between students and nature are typically made through environmental education (EE). In the past four decades, the majority of research has sought to identify an optimal way to increase the environmental awareness of students in EE programs (Stevenson, Brody, Dillon, & Wals, 2014). Social scientists have looked at potential relationships between awareness and attitudes, and between attitudes and knowledge, each with the hypothesis that EE could change behavior through these channels (Lotz-Sisitka, Fien, & Ketlhoilwe, 2013).

Education researchers have also investigated pedagogical strategies for influencing the behaviors of students (Dillon, Heimlich, & Kelsey, 2013). Researchers in natural resources disciplines have combined approaches by attempting to influence behaviors through both environmental awareness and instructional design. Many now believe that building soft skills, such as critical thinking and problem solving, combined with motivations and attitudes can produce the desired behavior changes (Lundholm, Hopwood, & Rickinson, 2013). Other researchers who implemented place-based education, which can put environmental content into the local context, observed positive outcomes for behavior changes and academics (Smith, 2013). Working toward environmental literacy through cognitive channels, and therefore instructional design, and through affective channels, such as attitudes, has given rise to several theories which may guide EE research and practice.

Theoretical Framework

The two theories providing the framework of this study were Constructivist Learning Theory (CLT) and a cognitive hierarchy developed by Vaske and Donnelly (1999). Cognitive hierarchy is a conceptual layout of cognitions which predate behavior. The top of the hierarchy contains behaviors, which are the end result of various cognitions. The bottom of the hierarchy contains values, which are thought to be the deep-rooted source of influence on cognitions. Behaviors are many in number and refer to specific actions performed by individuals. Behaviors are preceded by behavioral intentions, which are the determinations to perform specific behaviors. Behavioral intentions are influenced by attitudes, which are fewer in number than intentions and are themselves influenced by value orientations. Value orientations are patterns of basic beliefs, which can be applied to certain classifications of things, such as wilderness rights. Values are few in number, central to a person's identity, and difficult to influence. This value-attitude-behavior hierarchical model comes from Vaske and Donnelly (1999) who modified the original model proposed by Fulton, Manfredo, and Lipscomb (1996). This theory was applied here to understand how UGA student-athletes' environmental attitudes might be related to their environmental behavioral intentions as a result of environmental education (EE).

The theoretical approach of EE taken in this study was CLT, which utilizes Jean Piaget's 1952 concept of schemas to understand student learning. A central tenet of CLT is the idea that students enter a classroom with existing schemata, which are organized patterns of thought. These schemata exert influence on students' learning. That is, the palatability of certain information for students will depend on their schemata, and thus their ability to learn certain information will depend on how well an instructor takes the individual learning style of the student into account. Thus, EE is successful when tailored to suit students' learning styles Successful students will adjust their schemas to account for the new information (Glasersfeld, 1995; Jonassen, 1999; Piaget, 1952; Vygotsky, 1978).

The cognitive hierarchy and CLT were applied to the design of the EE program in this study to ensure the success of the program in influencing students' environmental and academic orientations. To measure the success of the application of these theories, a survey was developed, tested, and implemented. However, before the design of the EE curriculum and the survey, literature in the fields related to environmental psychology were sought for guidance in planning this study.

Survey Design Literature

Throughout decades of research on EE, multiple modes of assessment have been utilized, and each method has had positive and negative aspects (Leeming et al, 1993; Zint, 2013). This study measured effects of EE with a pretest-posttest survey. Constructing a survey that remains effective across groups can be challenging, thus many surveys are constructed for use within a specific study. Often, when surveys are designed to have universal application, modifications must be made before each implementation within a study (Larson, Green, & Castleberry, 2011).

Research is sometimes conducted on a single group at a time, such as children, minorities, university students, or recreationists, resulting in surveys and scales which can be utilized only among studies of a particular group. However, repeated use of a survey can increase its reliability and validity. For example, the New Environmental Paradigm (NEP) was used in many studies and was modified and adapted for a wide variety of populations (Dunlap, 2008).

Each time the NEP was used its validity and reliability were reported, and support for its use in future research increased. Eventually, creators of the survey made revisions and released a new edition, the New Ecological Paradigm [(NEP) (Dunlap, Van Liere, Mertig, & Jones, 2000)]. The NEP has since influenced the development of similar instruments for children, university students, and others (Dunlap, 2008). For this study, multiple scales from the literature were modified for the university student-athlete population (Andrews & Clark, 2011; Larson, Green, & Castleberry, 2011; Leeming et al., 1995; Pintrich & De Groot, 1990; Solberg et al., 1993; Vaske & Donnelly, 1999; Zimmerman et al., 1992).

Environmental education research in recent decades has begun to focus on learning outcomes of students, and although evaluations of these learning outcomes can vary, they often burden students with a battery of questions (Chawla & Cushing, 2007; Ernst & Monroe, 2004; Rickinson, 2001). Some EE programs evaluate outcomes with surveys measuring constructs such as attitudes (Larson, Green, & Castleberry, 2011), values (Rideout, 2005), and behaviors (Hsu, 2004), however there is a need for a comprehensive survey which measures both learning outcomes and affective environmental constructs (Hungerford, Volk, & Ramsey, 2000).

Children and young adults are an example of a population for whom scales must sometimes be adjusted from the original scale. Fortunately, multiple surveys constructed to specifically measure childrens' environmental perceptions have been created and tested. A prime example of a well-constructed survey for children's environmental awareness and attitudes is the Children's Environmental Perceptions Scale [(CEPS) (Larson, Green, & Castleberry, 2011)]. The CEPS has been used in other studies and assesses global constructs in children (Bergman, 2015). In addition to awareness, knowledge can also be a prerequisite for environmental attitudes

(UNESCO, 1978), however knowledge scales tend to be constructed for specific studies or EE programs.

Environmental education has aimed to progress beyond influencing attitudes and worldview, however, thus evaluations of EE programs must also be equipped to measure participants' behavioral intent. One example of a behavioral intent scale whose validity and reliability has been confirmed by multiple researchers is the Children's Environmental Attitudes and Knowledge Scale [(CHEAKS) (Leeming, Dwyer, & Bracken, 1995)]. The CHEAKS contains ten items, with original reliability values of 0.88, and consistently produces two constructs which evaluate respondents' intent to engage in proenvironmental behaviors and environmental knowledge (Walsh-Daneshmandi & MacLachlan, 2006). According to the cognictive hierarchy, behavioral intent is considered a predictor of a person's actual behaviors, thus behavioral intent became a construct of interest in this study.

Researchers studying learning outcomes of EE have posited that building the skills needed to perform proenvironmental behaviors is also a necessary product of EE. Environmental education may directly or indirectly influence the development of behavioral skills in participants. Skills may be built directly through participating in curricular activities, or indirectly through critical thinking, problem solving, and self-efficacy. Therefore, some EE programs exist which incorporate EE into traditional curricula and measure student learning outcomes, such as motivation, study strategies, and self-regulatory learning through surveys or exams. Some surveys evaluating these "soft skills" have been used numerous times in educational psychology and environmental psychology research (Bandura, 1990; Bandura, Barbaranelli, Caprara, & Pastorelli, 1996). Thus, several scales which have demonstrated sound reliability and validity exist to measure these learning constructs.

For example, the Children's Multidimensional Self-Efficacy Scale [(CMSES) (Bandura, 1989)], quantifies participants' self-regulatory learning behaviors. Bandura argued that self-efficacy and self-regulation were essential for influencing students' academic behaviors. Therefore, influencing students' behaviors may occur through self-efficacy. Another scale, which was constructed specifically for college students, is the College Self-Efficacy Inventory [(CSEI) (Solberg et al., 1993)], and the Motivated Strategies for Learning Questionnaire [(MSLQ) (Pintrich & DeGroot, 1990)]. Each of these scales examines mental constructs which, when present in students, can positively influence behavior in school.

When skills such as self-efficacy are applied to environmental behaviors, the result is similar when applied to academic pursuits. Belief in one's ability to perform certain actions is a necessary prerequisite for performing the actions. For this reason, efforts to improve self-efficacy can lead to an increase in pro-environmental behavior (Kollmuss & Agyeman, 2002; Tabernero & Hernández, 2011). Thus, self-efficacy and related constructs are essential variables to measure before and after EE interventions.

Environmental Education Literature

The importance of environmental education has been widely documented in education and natural resources literature (Stevenson et al., 2014). The gap between students and nature widens for many students during college (Lozano, Lozano, Mulder, Huisingh, & Waas, 2013). Environmental literacy requirements are in place at many universities, yet some requirements remain inadequate (Moody & Hartel, 2007). Moreover, many student-athletes declare majors in humanities or social sciences, where environmental content is rarely present (Fountain & Finley, 2011). The unequal exposure of student-athletes to environmental issues is coupled with an increased risk of academic difficulty in this subpopulation of university students. Therefore, a well-constructed EE intervention, which focuses on instructional design, the local environment, and pragmatic solutions to sustainability issues may assist in the improvement of environmental literacy and academic outcomes of university student-athletes (Gayles & Hu, 2009).

The ultimate goal of EE is to change the behaviors of its participants (Stapp, 1969; Stevenson et al., 2014). Traditionally, EE researchers have thought the process of influencing behavior begins with awareness, which leads successively to knowledge, attitudes, skills, and action (Hines, Hungerford, & Tomera, 1987; UNESCO, 1978). However, recent research has added several mental constructs to this model. In particular, some researchers state that factors such as self-efficacy, critical thinking, and sense of place may also be precursors to pro-environmental behaviors (Ernst & Monroe, 2004; Kudryavtsev, Stedman, & Krasny, 2012; Meinhold & Malkus, 2005; Vaske & Kobrin, 2001). Other researchers state that outcomes of EE improve when instruction improves, leading to tools such as Project Learning Tree, Project WET, and Project WILD (American Forest Foundation, 2006; Project WET International Foundation, 2010). Such curricular resources attempt to integrate environmental information with students' pre-existing mentalities, through constructivist teaching methods adapted from Constructivist Learning Theory. Studies have repeatedly shown these methods to be effective in improving pro-environmental behavior (Ballantyne & Packer, 1996; Klein & Merritt, 1994; Wals & Dillon, 2013).

In addition to improving EE materials, efforts have also been made to expand the presence of EE in classrooms and extracurricular environments, as a result of Agenda 21 (UNESCO, 2004). Therefore, an increasing number of schools, nature centers, and other institutions have begun to administer EE programs or integrated EE principles into existing programs (Coyle, 2005). However, some gaps still exist in university settings (Moody & Hartel, 2007).

Student-Athlete Academic Support Literature

Proportionately fewer student-athletes choose majors which investigate environmental issues (Fountain & Finley, 2011). At the same time, student-athletes typically have a larger environmental footprint than the rest of the student body (Casper, Pfahl, & McSherry, 2012). For instance, student-athletes travel to and from practice each day, travel to and from "away" events, and require special facilities, which use energy, water, and produce waste. There are also substantial indirect effects of university athletics, such as those produced by fans who travel to games and participate in "tailgating" activities. Some efforts have been made to reduce the environmental costs associated with university athletics, but most of these efforts have been concentrated on improving the sustainability of facilities and travel (Schmidt, 2006). Few universities actively seek opportunities to educate their student-athletes in improving their individual footprints, despite possessing the potential to educate them (Mallen, Hyatt, & Adams, 2010; Pfahl, Casper, Trendafilova, McCullough, & Nguyen, 2014).

Most National Collegiate Athletic Association Division I universities provide academic support services to student-athletes, through counseling, tutoring, and mentoring. The University of Georgia (UGA) provides academic mentoring to its student-athletes to help balance their athletic and academic responsibilities. The mentoring environment offers several advantages, which can facilitate an EE intervention. Student-athletes receive one-on-one, personalized mentoring with mentors who are trained to adapt instruction according to their students' particular learning style. Mentoring is thus particularly suited for EE, as the personalized education can be place-based, which has been established as an effective EE approach (Smith, 2013). Student-athletes can learn about environmental issues occurring near them in an environment that caters to their learning style. The mentoring relationship thus eases the process of influencing behavior. In addition to being advantageous for EE, mentoring also assists student-athletes with their academic difficulties.

The typical life of a student-athlete does not condone effective studying habits (Carodine, Almond, & Gratto, 2001). Therefore, many student-athletes need assistance in learning time management, organization, and task prioritization. Mentoring is typically employed to help them learn these skills. Universities who implement mentoring programs for student-athletes have evaluated their programs and reported their effectiveness in the literature (Abara, Kiesler, & Lopez, 2008; Calamai, Greene, Specht, Wachs, & Wilson, 2009; Vreeland, Casavant, Wack, Lear, & Poch, 2011). Mentoring has been shown to improve retention and graduation rates, self-efficacy, and productivity. The relationship students develop with their mentors can facilitate the procurement of self-motivation, which is particularly important for at-risk students, such as some student-athletes (Crisp & Cruz, 2009; Jacobi, 1991). Several assessments of mentoring programs have arisen in recent years, including surveys. One example of a peer mentoring survey came from Aston University, and this survey assessed several aspects of mentoring relationships and skills obtained through mentoring. Many concepts in the Aston University survey coincide with the goals of UGA's mentoring program, making it a suitable evaluation tool for this study (Andrews & Clark, 2011).

The need to improve the environmental literacy of student-athletes and to assess the effectiveness of the mentoring program together provided an opportunity to implement an EE intervention. Thus, this study attempted to combine traditional theoretical approaches, using the cognitive hierarchy, with pedagogical approaches, specifically Constructivist Learning Theory

(CLT), in the context of Athens, Georgia, to influence the behaviors of university student-athletes. An EE curriculum was introduced into the mentoring program at the University of Georgia, and a survey was constructed with a combination of newly-created items and items adapted from existing surveys. The survey was administered as a pretest-posttest to measure the outcomes of the EE-based mentoring program and also helped evaluate the efficacy of the mentoring program. The following two chapters discuss this study further.

CHAPTER 2

CONSTRUCTION AND VALIDATION OF THE STUDENT-ATHLETE ENVIRONMENTAL AND ACADEMIC ORIENTATIONS SURVEY

[1]Mullenbach, L. E. and G. T. Green. To be submitted to *Environmental Education Research*.

Abstract

Many surveys exist which measure environmental orientations, yet few measure the learning outcomes, such as self-efficacy, motivation, and self-regulatory learning, sought in recent efforts by environmental education researchers. This study created a survey which comprehensively measured attitudes, behaviors, knowledge, academic self-efficacy, self-regulatory learning, motivation, and use of learning strategies as a result of environmental education programming. A pilot survey was tested with 91 student-athletes in spring 2014. After revisions the final survey was administered to 140 student-athletes, 64 of whom completed the study in Fall 2014 and Spring 2015. The development of the survey was part of a broader study which also measured the effects of environmental education programming within academic mentoring. Cronbach's alpha reliability coefficients for each construct in the survey were above 0.7. Item loadings on each construct were above 0.5 with no cross-loading items. However, additional studies are needed to determine the survey's efficacy in regard to environmental values, environmental knowledge, motivation, and use of learning strategies.

Introduction

Research in recent decades has investigated the learning outcomes of environmental education (EE) programs (Chawla & Cushing, 2007; Ernst & Monroe, 2004; Mintz & Tal, 2014; Rickinson, 2001; Thomas, 2009). Although evaluation methods of these learning outcomes varies, they often involve an examination or battery of questions, such as that used by Ernst and Monroe (2004), to measure academic constructs such as critical thinking skills (Ernst & Monroe, 2004) and self-efficacy (Meinhold & Malkus, 2005). Participants in EE programs may also complete surveys measuring constructs such as environmental attitudes, behaviors, values, or knowledge in addition to completing learning outcome assessments (Hungerford, Volk, & Ramsey, 2000). However, since recent research has sought to measure both environmental orientations and learning outcomes, there is a need for a cohesive survey that would measure both academic constructs and environmental constructs. Capturing both domains in a single survey may also help alleviate survey burden and response fatigue of participants.

Currently several surveys exist to measure environmental constructs, and some have proven more reliable and valid across time and populations than others. For instance, some researchers (De La Vega, 2004; Manoli, Johnson, & Dunlap, 2007) elect to use the New Ecological Paradigm (NEP) scale (Dunlap, Van Liere, Mertig, & Jones, 2000) to measure environmental attitudes, but the NEP has been adjusted by some researchers to be more appropriate for some audiences, such as children (Manoli, Johnson, & Dunlap, 2007). Some researchers have also reported validity issues with the NEP, stating it measured multiple dimensions rather than its intended single-dimensionality (Cordano, Welcomer, & Scherer, 2003; Ewert, Place, & Sibthorp, 2005). Other attitudes surveys (Larson, Green, & Castleberry, 2011) are better suited for younger audiences. Several surveys also measure behavioral intent, such as the Children's Environmental Attitudes and Knowledge Scale [(CHEAKS) (Leeming, Dwyer, & Bracken, 1995)]. Studies which have used the CHEAKS reported reliability scores above 0.7 and have demonstrated discriminate validity between the attitudes and knowledge scales (Carrier, 2009; Duerden & Witt, 2010; Makki, Abd-El-Khalick, & BouJaoude, 2003). Other surveys measure value orientations, which are patterns of basic beliefs related to specific classes of things, such as natural resources or wildlife, that act as an evaluation of participants' core identities and long-standing beliefs. For example, the Forest Values Scale (Vaske & Donnelly, 1999) contains nine items which place respondents on a values spectrum from biocentric to anthropocentric. In addition to the surveys and scales mentioned here, several others may be found in the literature (Gagnon Thompson & Barton, 1994; Kaiser, Oerke, & Bogner, 2007; Weigel & Weigel, 1978).

However, researchers who seek to measure critical thinking skills, self-efficacy, motivation to learn, and self-regulatory learning often have a broader array of surveys and scales to select from. For instance, psychometric scales have been studied and used by researchers longer than scales measuring environmental orientations. However, some psychometric surveys demonstrate stronger reliability and validity than others, such as the Motivated Strategies for Learning Questionnaire (MSLQ), which has reported reliability coefficients ≥ 0.8 (Duncan & McKeachie, 2005), the College Self-efficacy Inventory (CSEI), which has reported reliability values > 0.8 and demonstrated predictive validity (Gore, Leuwerke, & Turley, 2005), and the Children's Multidimensional Self-Efficacy Scale (CMSES), which has reported factor loadings above 0.3 with few cross-loadings (Choi, Fuqua, & Griffin, 2001). However, other surveys, such as the Self-Efficacy Scale (Sherer & Maddux, 1982), the College Academic Self-Efficacy Scale

(Owen & Froman, 1988), and the Student Readiness Inventory (Le et al., 2005), have had accessibility issues or have become outdated.

Surveys that evaluate the effectiveness of peer mentoring and other academic mentoring services also exist (Allen, Eby, & Lentz, 2006; Andrews & Clark, 2011; Comeaux, 2010; Slicker & Palmer, 1993). However, none comprehensively evaluate mentoring programs designed for university student-athletes or evaluate both EE programs and mentoring programs simultaneously.

Problem Statement

The University of Georgia (UGA), like many other NCAA Division I universities, focuses considerable resources on mentoring and tutoring programs aimed at providing student-athletes with additional help and support in their academic endeavors. However, these programs are rarely evaluated or examined in terms of their approach or possible academic impact on student-athletes.

Purpose Statement

Thus, this study sought to develop a survey that would evaluate the effects of a sustainability-focused, EE-based academic mentoring program on the environmental and academic orientations of university student-athletes. An evaluation of the existing mentoring program at UGA was necessary, as previous evaluations were limited to interviews involving a small number of student-athletes (Gale, 2011). In addition, it was necessary to know the general opinions of the student-athletes in regard to the program; thus, the survey included a scale that measured the attitudes of participants towards their mentors and the mentoring program as a whole. Hence, the overall purpose of this study was to develop a survey which could accurately and reliably assess the outcomes of an EE-based mentoring program.

Research Objective and Hypotheses

Objective 1: To develop a reliable and valid survey that measured environmental attitudes, behaviors, knowledge, academic self-efficacy, self-regulatory learning, motivation, use of learning strategies, and attitudes toward mentoring and tutoring of student-athletes (named the Student-Athlete Environmental and Academic Orientations Survey, or SEAOS).

Alternative Hypothesis 1a: Cronbach's alpha reliability coefficients will reveal that data from the SEAOS provided consistent, statistically significant responses for student-athletes of both treatment and control groups.

Alternative Hypothesis 1b: Principal components analysis of pilot test data will reveal that the SEAOS contains several underlying dimensions of environmental and academic orientations of student-athletes

Alternative Hypothesis 1c: Principal components analysis will confirm that data from the SEAOS revealed the component structure hypothesized in the pilot test.

Methods

In this study, a survey measuring environmental and academic orientations of student-athletes was created, titled the Student-Athlete Environmental and Academic Orientations Survey (SEAOS). The SEAOS also assessed student-athletes' attitudes regarding the Athletic Association's mentoring program at the University of Georgia (UGA). In this mentoring program, student-athletes were paired with a mentor for one semester and met two to three times each week for hour-long sessions to develop study strategies, time management, skills, and organization. The development of the survey was part of a larger study conducted by UGA which also examined the outcomes of an EE-based mentoring program. More details of the larger study can be found in Chapter 3.

Study Population

The study population intended for the SEAOS was university student-athletes. The sample which debuted the SEAOS was composed of student-athletes enrolled in the UGA Athletic Association (UGAAA) academic mentoring program. The NCAA Division I sports represented in the sample included baseball, women's basketball, equestrian, men's and women's golf, gymnastics, soccer, softball, men's and women's swim and dive, men's and women's tennis, men's and women's track and field and cross country, and volleyball. The UGAAA mentoring program is not limited to particular sports, majors, or academic years, so this study included a sample from a broad range of sports, majors, and academic years.

In development of the SEAOS, standard psychometric procedures from the literature were utilized to ensure adequate reliability and validity of the SEAOS (Vaske, 2008), which are outlined in following steps:

1. A comprehensive review of existing literature pertaining to environmental attitudes and academic orientations of student-athletes.
2. Identification of existing appropriate survey items.
3. Adaptation of existing items and creation of new items.
4. Pilot testing a draft survey, analysis, and modification of the draft survey.
5. Implementation of the final SEAOS.

Literature Review

A literature search revealed several surveys that examined environmental and academic constructs of interest in this study. The surveys with robust validity and reliability were examined further for fit within this study. The criteria for acceptable validity included high factor loadings (≥ 0.5) with few cross-loadings. Additionally, components with eigenvalues greater than one were retained (Kaiser, 1970; Russell, 2002). For reliability the acceptable criterion was Cronbach's $\alpha > 0.7$ (Vaske, 2008). Finally, a comprehensive set of questions and statements with related scales was compiled from previous surveys (Andrews & Clark, 2011; Larson et al., 2011; Leeming et al., 1995; Pintrich & De Groot, 1990; Solberg et al., 1993; Vaske & Donnelly, 1999; Zimmerman et al., 1992). Some new items were also created and reviewed by a panel of researchers experienced in this subject matter.

Constructs to be measured by the SEAOS were selected based on the two theories guiding this study, Constructivist Learning Theory and cognitive hierarchy. Additionally, these constructs were confirmed by examining previous studies of the effect of EE on academic outcomes (Hines, Hungerford, & Tomera, 1987; Stern & Dietz, 1994). From those examinations, it became evident that certain constructs would be appropriate for this study's population. Subsequently, attitudes, behavioral intent, values, and knowledge were deemed appropriate environmental constructs to assess the effect of EE programming on the environmental orientations of student-athletes. Furthermore, self-efficacy, motivation, and use of learning strategies were also deemed appropriate academic domains to assess the effect of EE programming on the academic outcomes of student-athletes (Ernst & Monroe, 2004; Hungerford et al., 2000).

Some researchers seeking to measure environmental attitudes elect to use the revised New Ecological Paradigm Scale (NEP), but the NEP was not used in the SEAOS because it was considered inappropriate for the study population. The NEP measures general environmental worldview and values, but it has not proven to be a robust measure of environmental attitudes of younger participants (Larson, Green, & Castleberry, 2011). Instead, modified versions of the items which Larson et al. developed for children aged 6-13 years old which were repeated with fourth, fifth, and seventh grade students in a study by Bergman (2015) were adapted for use in this study. General attitude measurements typically capture affective domains, such as behavioral intent, more than cognitive domains; this focus was deemed appropriate for this survey, because cognitive domains were already addressed by other scales in the survey, including environmental knowledge (Gray & Weigel, 1985).

Behavioral intent was measured with items from the Children's Environmental Attitudes and Knowledge Scale (CHEAKS). Original CHEAKS items were reworded to suit this study's population, as the original version was meant for children at the pre-college level. Other items which have become outdated or did not suit this study's population were removed. The knowledge subscale of the CHEAKS was not used as it did not measure the EE knowledge used within the program in this study.

The SEAOS incorporated questions that measured environmental values of student-athletes, which could reveal baseline beliefs. The Forest Values Scale from Vaske and Donnelly (1999) was incorporated within this study based upon its broad scope and robust reliability ($\alpha \geq 0.8$) and validity (loadings ≥ 0.6).

In addition to environmental domains, the SEAOS included items to measure several academic domains, the primary of which is self-efficacy. To measure academic self-efficacy in student-athletes, items from the academic subscale of the College Self-Efficacy Inventory (CSEI) were reworded before incorporation into the SEAOS. The CSEI was selected based on its use in previous studies such as Gore (2006), which looked at self-efficacy beliefs as they related to college outcomes and accounted for four to ten percent of variance in GPA scores when measured at the end of the semester. To add components measuring self-efficacy on the SEAOS, the Self-Efficacy for Self-Regulated Learning subscale of the Children's Multidimensional Self-

Efficacy Scale (CMSES) was also adapted. Minor modifications were made to clarify wording and increase relevancy for university students, as the original CMSES was meant for high school students. Bandura developed the CMSES in 1989, and since its introduction it has been used in other studies which reported reliability coefficients above 0.7. (Bandura et al., 1996; Bandura, Barbaranelli, Caprara, & Pastorelli, 2001).

In addition to self-efficacy, the SEAOS sought to capture the academic motivations of student-athletes. The motivation items modified for this study were from the Motivated Strategies for Learning Questionnaire (MSLQ) (Pintrich & De Groot, 1990). Some of the items in the Self-Efficacy subscale and the Cognitive Strategy Use subscale of the MSLQ were modified to provide greater clarity and a more student-centered perspective; Test Anxiety, Intrinsic Value, and Self-Regulation subscales of the MSLQ were not used, because they did not align with the objectives of this study or with the mission of the UGAAA mentoring program.

To benefit stakeholders, which included the Director and Mentor Coordinator of the Rankin Smith Student-Athlete Academic Center (Rankin) at the University of Georgia, items aimed at measuring the attitudes of student-athletes toward the mentoring and tutoring programs at Rankin were also included in the SEAOS. Researchers at Aston University developed an evaluation of peer mentoring at their university, which measured “effectiveness of mentoring for learning experiences” and the “value of peer mentoring” (Andrews & Clark, 2011, pp. 9-10). Both Aston University evaluations were adapted and utilized in the SEAOS because of their relevance to UGAAA mentoring program goals. Items from these two evaluations were also adapted for the SEAOS tutoring attitudes section of the survey.

The content of the environmental knowledge questions was specific to the EE lessons developed for this study. Knowledge items in the literature did not sufficiently capture the content provided in the EE curriculum used in this study, so it was necessary to create new items. The EE curriculum focused on five topics, and two items were created for each topic, totaling ten items in the environmental knowledge scale.

Adaptation of Existing Survey Items

Items from the following scales were adapted for use within the SEAOS: Children's Environmental Attitudes and Knowledge Scale (Leeming et al., 1995), Children's Environmental Perception Scale (Larson, Green, & Castleberry, 2011), Children's Multidimensional Self-Efficacy Scale (Bandura, 1989), College Self-Efficacy Inventory (Solberg et al., 1993), Forest Values Scale (Vaske & Donnelly, 1999), and the Motivated Strategies for Learning Questionnaire (Pintrich & DeGroot, 1990). The number of items from each scale is displayed in Table 2.1.

Table 2.1

SEAOS Items Per Construct and Original Sources

Construct	# of Items	Original Source
Environmental Attitudes	6	Larson, Green, & Castleberry, 2011
Environmental Behavioral Intent	10	
Individual Action	7	Leeming, Dwyer, & Bracken, 1995
Collective Action	3	
Environmental Values	5	Vaske & Donnelly, 1999
Academic Self-Efficacy	8	Solberg et al., 1993
Self-Efficacy for Self-Regulatory Learning	8	Bandura, 1989
Academic Motivation	9	Pintrich & DeGroot, 1990
Use of Learning Strategies	12	Pintrich & DeGroot, 1990
Attitudes toward Mentoring	13	
Personal Relationship with Mentor	4	Andrews & Clark, 2011
Academic Mentoring	9	
Attitudes toward Tutoring	15	Andrews & Clark, 2011

Once applicable items were identified, they were reviewed by researchers familiar with the subject area. Some items were reworded for clarity, to be more personally relevant, or to be more appropriate for the study population. Personal relevancy, rather than a focus on the world or humanity, was recommended in the literature (Schindler, 1999). Table 2.2 in Appendix B shows modification of SEAOS items following the pilot test.

Creation of New Items

Despite the ample supply of survey items gathered from the literature search, some constructs required the creation of new items. For example, the mission of the UGAAA mentoring program is to enable students to work independently and organize their classes and studying around athletic obligations. Thus, to measure the ability of student-athletes to balance all aspects of their lives, we added an item "I am confident I can keep up with my athletic training" among items which refer to the ability to keep up-to-date with schoolwork and other aspects of life. Items were created in groups of at least three to ensure adequate measurement of a construct. New items were also evaluated by researchers familiar with the subject areas, as well as by the stakeholders.

Pilot Testing

Once modified items and new items were compiled into a draft survey, a pilot test was conducted. In Spring 2014, the draft SEAOS was tested with 91 student-athletes at UGA. The pilot sample was divided randomly into a treatment group composed of 31 student-athletes and a control group composed of 60 student-athletes using a random number generator. All student-athletes who participated completed the SEAOS as a pretest-posttest, as the pilot EE curriculum associated with this study was also initiated in Spring 2014. The pretest was administered over several weeks in January, and the posttest was administered over several weeks in late April to early May. The pilot test was conducted to reveal any issues in reliability and validity of the SEAOS. In addition, a focus group with stakeholders, which included the Director of the Student-Athlete Academic Center and Mentor Coordinator, provided feedback on the SEAOS.

Final Implementation

Final implementation of the SEAOS took place in Fall 2014 and Spring 2015. The SEAOS was administered as a pretest-posttest because differences between and within groups over the course of a semester were examined. Additionally, original scales from which the SEAOS was adapted typically utilized a pretest-posttest structure. The final study sample was divided into a treatment group and a control group by the same means as the pilot test.

Items in the SEAOS pertaining to environmental attitudes, behaviors, and values used a Likert-type scale, in which student-athletes were given five answer choices (i.e., from "Strongly Disagree" to "Strongly Agree") in response to several statements. At the end of the environmental behavior scale, an open-ended question asked student-athletes to list any additional pro-environmental behaviors they frequently practice.

The academic items used a seven-point semantic scale (e.g., from 1, "not at all true of me" to 7, "very much true of me"). Additionally, an open-ended question asked for any other study strategies student-athletes used regularly. In attitudes toward mentoring and tutoring items, student-athletes responded to such statements as, "I trust the advice given by my mentor," on a five-point Likert-type scale from "Strongly Disagree" to "Strongly Agree." The environmental knowledge items consisted of ten multiple-choice questions with four answer choices for each question. The content of the environmental knowledge items pertained to main ideas presented in the EE curriculum associated with this study.

Results

Pilot Testing

During the focus group, stakeholders noticed some items did not reflect the mission or objectives of the mentoring and tutoring programs. Specifically, some items regarding the tutoring program failed to assess which learning strategies developed in tutoring were most effective. Subsequently, some items were reworded or removed based on results from Cronbach's alphas, principal components analysis (PCA), and feedback from the stakeholders.

Table 2.3 displays Cronbach's alpha coefficients of pilot scores. Items with an alpha coefficient below 0.5 were removed to improve scale reliability. Inter-item correlations were also examined, and items with negative correlations were removed. Varimax rotation was utilized because the original scales had been used previously in the literature and shown to have strong construct validity; however, with a new scale it was unclear whether the items would correlate. The final SEAOS was implemented as part of a study to evaluate environmental education within UGAAA's academic mentoring program, the details of which can be found in Chapter 3.

Table 2.3
Cronbach's Alpha Reliability Coefficients and Eigenvalues for Pilot SEAOS

Scale	Cronbach's α	Eigenvalue
Environmental Attitudes	0.79	2.71
Environmental Behaviors	0.82	6.09
Use of Learning Strategies	0.90	2.72
Academic Self-Efficacy	0.90	5.72
Self-Efficacy for Self-Regulatory Learning	0.93	5.68
Academic Motivation	0.97	9.74
Tutoring	0.97	2.94
Mentoring	0.97	11.95

Final Implementation

The final study sample contained 33 student-athletes in the treatment group and 31 student-athletes in the control group. Both samples included primarily freshmen and sophomores as most student-athletes enrolled in mentoring during those semesters were freshmen or sophomores.

The final SEAOS contained eight scales, which were followed by multiple-choice environmental knowledge questions, and concluded with sociodemographic items. Table 2.4

displays components identified in the SEAOS along with Cronbach's alphas of each component. Since the pilot test revealed strong item correlations, PCA using direct oblimin rotation was conducted to detect these structures in the study sample (Jennrich & Sampson, 1966). Table 2.5 in Appendix A displays the Kaiser-Meyer-Olkin Measure of Sampling Adequacy and Bartlett's Test of Sphericity, which indicated PCA was appropriate for each scale.

Table 2.4

Cronbach's Alpha Reliability Coefficients and Eigenvalues for SEAOS

Scale	Cronbach's α	Eigenvalue	% Variance explained within scale
Attitudes toward Tutoring	0.986	12.59	84.0
Attitudes toward Mentoring	0.969		
Academic Mentoring	0.972	9.55	73.5
Relationship to Mentor	0.954	1.47	11.3
Academic Motivation	0.952	6.52	72.5
Self-Efficacy for Self-Regulatory Learning	0.950	6.00	75.1
Academic Self-Efficacy	0.932	5.53	69.1
Use of Learning Strategies	0.926	6.78	56.5
Environmental Behaviors	0.891		
Individual Action	0.912	5.20	52.0
Collective Action	0.755	1.32	13.2
Environmental Attitudes	0.819	3.39	56.5

Two differences in component structure from the pilot test appeared in the final implementation of the SEAOS. The first difference was that environmental behavior items on the posttest loaded onto two components. Based on the type of actions the items referred to, the components were named Individual Action and Collective Action. However, further tests of construct validity did not reveal that these two components resembled separate constructs. Inter-item correlations revealed that Collective Action items were still highly correlated with Individual Action items, with the exception of two pairs of items. The two-pair exception was deemed insufficient to qualify the Collective Action component as a separate construct, and the hypothesized single-construct structure was retained. The study sample may have perceived their own behavior patterns differently when performing the different types of actions in the SEAOS, leading participants to respond to these two item types slightly differently. Loadings for environmental behavior items are displayed in Table 2.6.

The second structure difference was that items regarding attitudes toward mentoring also loaded onto two components, which were subsequently titled Academic Mentoring and Relationship with Mentor, based on item content. At the request of stakeholders, some new items were added pertaining to participants' relationship with their mentor, which may have rendered the new component. Loadings for attitude toward mentoring items are shown in Table 2.7. Table 2.8 in Appendix A displays component loadings of each other SEAOS scale.

Table 2.6
Pattern and Structure Matrix Coefficients for Principal Components Analysis using Oblimin Rotation of Two-Component Solution (Component A = Individual Action, Component B = Collective Action) for Posttest SEAOS

		Pattern		Structure	
Component	Item	A	B	A	B
A. Individual Action	3	**0.911**	-0.096	**0.887**	0.364
	4	**0.910**	-0.051	**0.867**	0.320
	1	**0.833**	0.022	**0.843**	0.403
	6	**0.795**	0.040	**0.814**	0.403
	10	**0.791**	0.006	**0.794**	0.367
	2	**0.641**	0.301	**0.779**	0.593
B. Collective Action	9	-0.110	**0.916**	0.308	**0.866**
	5	0.021	**0.767**	0.530	**0.799**
	8	0.209	**0.704**	0.371	**0.777**

Table 2.7
Pattern Matrix Coefficients for Principal Components Analysis using Oblimin Rotation of Two-Component Solution (Component A = Academic Mentoring, Component B = Relationship to Mentor) for Pre- and Posttest SEAOS

		Pretest (*n* = 106) Pattern		Posttest (*n* = 64) Pattern	
Component	Item	A	B	A	B
Academic Mentoring	1	**0.964**	-0.048	**0.900**	0.075
	4	**0.961**	-0.088	**1.062**	-0.176
	6	**0.955**	-0.124	**0.801**	0.146
	2	**0.911**	-0.074	**0.854**	0.123
	5	**0.834**	0.079	**0.986**	-0.111
	3	**0.826**	0.158	**0.650**	0.334
	8	**0.810**	0.094	**0.925**	-0.004
	7	**0.714**	0.159	**0.859**	0.022
	9	**0.702**	0.230	**0.770**	0.107
Relationship to Mentor	12	-0.018	**0.978**	-0.034	**0.945**
	11	0.008	**0.977**	0.049	**0.910**
	10	0.028	**0.943**	0.078	**0.871**
	13	0.071	**0.921**	0.015	**0.951**

Discussion and Conclusions

The research objective of this study was to create a reliable and valid survey that measured student-athletes' environmental and academic orientations, and the steps taken to construct the SEAOS achieved this objective. Each scale measured constructs that were confirmed through validity tests and produced Cronbach's alpha values above 0.7. Additionally, items loaded onto components at or above the predetermined minimum acceptable level of 0.5.

Pilot testing revealed some issues with certain items. Three items in the environmental attitudes scale which addressed harming nature or the ways in which humans can alter nature illogically loaded on a separate component. Those three items were negatively-worded which may have led participants to respond to them differently or erroneously, resulting in a second illusory component. To retain a single-component structure and improve the Cronbach's alpha coefficient, those items were removed. Additionally, some items in the behavioral intent scale referred to behaviors that were outdated (e.g., writing letters, going door-to-door), and the items were subsequently removed. Some items in the academic scales also experienced issues in the pilot test. Consequently, 12 items were removed to improve loadings and reliability. Modifications made as a result of the pilot test are displayed in Table 2.2 in Appendix B.

Despite pilot testing and corrections, the environmental knowledge scale did not appear to adequately measure the cognitive outcomes of the EE curriculum. Student-athletes, regardless of the number of EE lessons they completed, did not improve knowledge scores on the posttest. Both groups had equal knowledge levels on the pretest. The knowledge questions may have been too specific and hence did not reflect the holistic approach of the EE curriculum. However, the knowledge scale was constructed for this specific study, unlike the attitudes and behavior scales which were constructed for wider applicability. Therefore, the lack of significant results from the knowledge scale should not hinder the ability of future studies to successfully use the SEAOS to measure affective (e.g., attitudes) environmental constructs in university students.

The SEAOS was created to measure academic and environmental opinions of university student-athletes after engaging in activities such as environmental education. Increasingly, EE programs are beginning to incorporate learning styles, pedagogy, and interdisciplinary curricula (Ardoin, Clark, & Kelsey, 2013), creating the need for a survey instrument to evaluate such programs. The validated scales that compose the SEAOS are ideal for fulfilling this need. Moreover, if university student-athletes continue to require academic support and exposure to environmental knowledge, the use of the SEAOS in future studies would not only improve the instrument but also assist a population of students which engages in interventional EE programs. However, future studies should seek a sample size of at least 200 to ensure robust results of principal components analysis. This study was restricted to a smaller sample, thus further research is needed to improve the efficacy of the SEAOS. Through continued efforts to improve the environmental literacy of university student-athletes, universities can work to cultivate a culture of sustainability on their campuses as well as contribute to positive academic outcomes in some of their at-risk students.

CHAPTER 3

OUTCOMES OF ENVIRONMENTAL EDUCATION-BASED MENTORING

[1]Mullenbach, L. E. and G. T. Green. To be submitted to *Journal of Environmental Education*.

Abstract

Building a sustainable future will require environmental literacy (EL) for today's generation of college graduates. To achieve EL in its students, many universities adopt EL requirements. Additional environmental knowledge can be obtained from extracurricular activities. However, some university students, namely student-athletes, have fewer opportunities to achieve EL. Thus, in this study an environmental education (EE) curriculum was implemented within the Athletic Association Mentoring Program. Environmental attitudes, behavior, knowledge, self-efficacy, self-regulatory learning, motivation, and learning strategies were assessed before and after EE with a sample of University of Georgia student-athletes. Following EE, treatment group student-athletes experienced an improvement in their environmental behaviors ($t(32) = 2.34$, $p = 0.03$), self-efficacy ($t(32) = 2.07$, $p = 0.04$), and environmental attitudes ($t(32) = 1.83$, $p = 0.07$). However, more research is needed to determine differences between groups, such as gender, major, and sport. Additional research could investigate environmental values of mentors as well as student-athletes and be expanded into tutoring programs and writing centers.

Introduction

Environmental literacy among university students is necessary to cultivate a society that encourages environmentally responsible behavior (Shephard et al., 2014). Groups, such as the National Environmental Education and Training Foundation, have called for more efforts to increase the environmental literacy of the nation's students to preserve a future of environmental stewardship (Coyle, 2005). Furthermore, with the world continuing to move towards a more sustainable environment, educating future professionals in sustainable practices becomes imperative (Cortese, 1999; de Vreede, Warner, & Pitter, 2014). In the realm of higher education, universities typically adopt environmental literacy requirements to elevate environmental awareness, attitudes, and knowledge through campus-wide requirements for all undergraduates, major-specific requirements, or both (Wilke, 1995). Additionally, students can increase their environmental knowledge levels by joining campus organizations that advocate for sustainable actions and help solve environmental problems. Influencing pro-environmental behaviors, which is an effective means for reducing ecological impact, may require increased environmental literacy. Environmental education (EE) is a common way to help improve environmental literacy. Additionally, many universities are often equipped to assist students in achieving environmental literacy through campus-offered EE programs (Wilke, 1995).

However, opportunities to improve environmental literacy are not always offered equitably to all groups of students. One example of an underserved group is intercollegiate student-athletes. Because of time constraints student-athletes generally are not able to join activities outside of their sports, and therefore often miss opportunities to participate in campus-wide environmental initiatives (Carodine et al., 2001). Moreover, few student-athletes elect majors in the sciences where environmental concepts are explored (Fountain & Finley, 2011).

However, engaging in extracurricular activities has been shown to be beneficial to student-athletes by increasing personal self-concept, learning, and communication skills (Gayles & Hu, 2009). In addition to missing out on the academic benefits accrued by participation in EE programs, which could aid a population of students who are known for being at-risk academically, student-athletes miss out on achieving higher levels of environmental literacy.

The environmental impact of student-athletes is traditionally larger than that of other university students, which is one reason EE efforts should be targeted towards student-athletes. Despite being a healthy activity for an individual, athletics can be a detriment to the environment (Henly, 2013; Schmidt, 2006). In recent years, the UN Environment Programme (UNEP) has led efforts to help athletics activities reduce their impact to the environment, primarily through their Sports and Environment Program (Schmidt, 2006; UNEP, 1994). Actions such as improving the energy efficiency of athletics facilities, increasing recycling rates at events, and irrigating practice fields with rainwater have been implemented with professional and collegiate teams (Henly, 2013). Thus, efforts from the Natural Resources Defense Council (2013) and other groups have been moderately successful within professional and university athletics. However, little has been done to engage athletes in these efforts to promote “green” athletics, despite potential opportunities (Henly, 2013; Pfahl et al., 2014). Athletes have an opportunity to be leaders in sustainability if certain efforts are undertaken, such as introducing EE programs. Thus, possibilities exist to educate student-athletes in environmental issues and help them become leaders in environmental conservation (Mallen et al., 2010).

Despite the potential disparity in environmental literacy levels, student-athletes have opportunities to be role models of sustainability, especially those playing high-profile sports, who are highly visible and admired by the student body (Mallen et al., 2010). Previous attempts to increase student-athletes' environmental knowledge have included improving the sustainability of athletic facilities and promoting EE within university housing (Casper et al., 2012; Parece, Younos, Grossman, & Geller, 2013). However, few studies have analyzed the outcomes of extracurricular EE programs with student-athletes, despite the potential for initiating EE programs at many universities. This potential for EE programs may exist within the framework of academic support services provided to student-athletes.

Athletic Association Academic Services

Many National Collegiate Athletic Association (NCAA) Division I universities, including the University of Georgia (UGA), offer academic mentoring services to their student-athletes. These mentoring services help student-athletes manage their time, organize and complete their assignments, make measurable and achievable academic goals, and adjust to the balanced life of a student-athlete (Carodine et al., 2001). To encourage positive outcomes, mentors provide student-athletes with one-on-one education where they can connect to their course materials on a personal level (Colvin & Ashman, 2010).

The goals of UGA Athletic Association (UGAAA) Student Services are to improve academic decision-making, self-motivation, critical thinking skills, and life balance, as stated in their mentoring program mission statement (UGAAA, 2003). Despite such explicit goals, the current mentoring program has not had a thorough assessment of its effectiveness since 2011, and the previous assessment was completed by interviews only (Gale, 2011). Research has investigated the usefulness of academic support services for student-athletes and non-athlete students, and has found that mentoring leads to increased productivity, self-efficacy, graduation rates, and retention rates (Carodine et al., 2001; Crisp & Cruz, 2009; Jacobi, 1991). Self-efficacy, in particular, has been shown to correlate with academic performance (Chemers, Hu, & Garcia, 2001; Schunk & Zimmerman, 1997; Zimmerman, 2000). Additionally, fostering self-motivation has been shown to improve academic outcomes for at-risk students (McMillan & Reed, 1994; Pintrich & De Groot, 1990). Schunk and Zimmerman (1997) also found that having a positive academic role model, such as a mentor, had significant influence on students' development of self-efficacy and self-regulatory learning skills. Therefore, understanding the success of the current mentoring program is important in making progress toward UGA's goals.

Literature Review

Environmental literacy (EL) has myriad definitions, but many researchers agree with the spectrum provided by Roth (1992), which states individuals progress along the spectrum from nominal literacy, to functional literacy, to operational literacy. An effective means of achieving any level of EL is through EE (Chawla & Cushing, 2007; Disinger & Roth, 1992; Hungerford & Volk, 1990). Furthermore, EE can lead to other benefits beyond EL through mindful design of EE programs (Athman & Monroe, 2001; Ernst & Monroe, 2004; Warburton, 2003).

Research has documented that EE, both formal and informal, often provides a myriad of benefits for students in terms of academic achievement and positive behavioral change toward the local environment (Brody & Ryu, 2006; Chawla & Cushing, 2007; Ernst & Monroe, 2004; Parrish et al., 2005). Through EE initiatives, universities can address concerns regarding EL levels. In fact, research shows the benefits of incorporating EE programs and initiatives within university curricula (Warburton, 2003; Wilke, 1995). However, despite the fact that a paucity of EE opportunities may thwart both EL and learning outcomes, some universities are still less focused on sustainability outside of classrooms and majors. Therefore, it is important that universities consider elevating their EL standards and incorporate EE into more of their students' activities and experiences (Lozano, Lozano, et al., 2013; Lozano, Lukman, Lozano, Huisingh, &

Lambrechts, 2013; Roth, 1992; Wilke, 1995). Involving students in EE initiatives and offering informal EE programs can also help encourage a campus culture of sustainable action (Marans & Shriberg, 2012).

Since one purpose of EE is to influence pro-environmental behavior, investigating which cognitive processes lead to desired behaviors is vital. Historical EE research in the United States and abroad frequently posited that students adopt responsible environmental behaviors after attaining certain levels of awareness, knowledge, and attitudes (Stapp, 1969; UNESCO, 1975, 1978). Most early EE research focused on a linear relationship, in which environmental knowledge influences attitudes, which influence behavior (Kaiser, 1996; Stapp, 1969). This assumption that knowledge precedes and influences attitudes, which precede and influence behavior is still observed in studies of EE today. In many cases, EE has been found to be an important source of environmental knowledge for children, which can ultimately improve their environmental attitudes (Bradley, Waliczek, & Zajicek, 1999; Dettmann-Easler & Pease, 1999; Zelezny, 1999).

Recent studies in EE have examined behavioral intent, which precedes behavior, and sought to identify which personal factors may lead to behavioral intention. These later studies indicated that multiple factors, rather than simply knowledge, influence a person's intent to act responsibly, including values, skills, personality, and attitudes (Bamberg & Möser, 2007; Donald, Cooper, & Conchie, 2014; Hines et al., 1987; Kollmuss & Agyeman, 2002). However, knowledge should not be understated. Some EE researchers argue for a larger position of knowledge in EE research than attitudes and values (Ballantyne & Packer, 1996). One major theory outlined in EE research, called Constructivist Learning Theory (CLT) comes from the work of Piaget (1952) on children's cognition. Piaget's major premise is that when students learn, they may incorporate knowledge into their own existing cognitive constructs, through assimilation, or reconfigure their cognitive constructs according to the new information, through accommodation. Therefore, effective teaching allows students the freedom to learn individually and explore topics in a way that engages them (Klein & Merritt, 1994; Loughland, Reid, & Petocz, 2002). Through constructivist teaching practices, students can learn to make positive behavior choices towards the environment (Ballantyne & Packer, 1996). For example, in one study constructivist approaches to EE were shown to improve students' knowledge and attitudes more than traditional lecture approaches (DiEnno & Hilton, 2005). Furthermore, research has shown improvements are more likely when each student is given an opportunity to approach EE differently (Rickinson, 2001). When content is focused on individual action and is location-based, students feel a greater connection to the material (Brody & Ryu, 2006). Hence, one-on-one or personalized education, following the principles of CLT, within EE programs may help in promoting behavioral intent of students toward environmental stewardship, which is one of the goals of EE. Because of these reasons, academic mentoring may serve as an effective framework for EE programs.

The potential academic benefits from a student-centered EE program have several implications. Developing critical thinking skills, problem-solving skills, an increased sense of responsibility, and holistic thinking skills are just some of the potential cognitive and academic advantages of participating in EE programs (Ernst & Monroe, 2004; Hungerford & Volk, 1990; Thomas, 2009). Working individually with mentors provides student-athletes opportunities to learn about environmental issues in ways that fit their personality, learning styles, and prior knowledge, thus aligning with CLT (Ballantyne & Packer, 1996; DiEnno & Hilton, 2005; Klein & Merritt, 1994; Loughland et al., 2002).

Enhancing critical thinking skills could improve the overall academic performance of student-athletes, which could lead to an increase in retention and graduation rates. The development of these crucial skills can arise from a strategically designed EE curriculum (Ernst & Monroe, 2004; Rickinson, 2001; Thomas, 2009). Multiple resources exist to develop engaging and pedagogically sound EE curricula, several of which were used in this study.

Environmental Education Resources

Environmental education has made noteworthy progress toward the goals of influencing attitudes and behavior in the years since the United Nations Council on Environment and Development (UNCED) put forth the environmental action plan, known as Agenda 21, in 1992. Agenda 21 emphasized the importance of implementing education for sustainable development in both formal and informal educational systems in order to facilitate sustainable behaviors (UNCED, 1992). Recently, EE researchers have responded to Agenda 21 and the UN's Decade of Education for Sustainable Development (2005-2014) by incorporating more sophisticated teaching strategies into their research (UNESCO, 2004). Thus, many existing EE programs have evolved and developed stronger pedagogy and curricula (Moore, 2005; Warburton, 2003). Well-developed and widely-used EE learning resources have also emerged, such as Project Learning Tree and Project WET. Research has shown that problem-based learning can be an effective means of encouraging pro-environmental behavior (Brody & Ryu, 2006; Thomas, 2009). These EE resources work effectively with CLT because of their individual, interactive, and problem-solving based nature, thereby making them appropriate for this study.

In addition to improving environmental knowledge, some EE programs focus on improving cognitive constructs such as self-efficacy. Self-efficacy is commonly defined as a person's belief in her or his ability to perform a certain action (Bandura, 1994). Self-efficacy has been shown to correlate with academic performance (Chemers et al., 2001; Schunk & Zimmerman, 1997; Zimmerman, 2000). Self-efficacy has also been shown to moderate the relationship between environmental attitudes and behaviors (Meinhold & Malkus, 2005). Therefore, understanding the success of UGA's current mentoring program in improving self-efficacy is important to make progress toward EE goals. Additionally, if an EE program designed for student-athletes is found to create a significant difference in the academic performance of student-athletes, there could be implications for mentoring programs across campus.

Problem Statement

Despite the potential benefits of EE programming for student-athletes, in terms of increasing their environmental attitudes, behavioral intent, and knowledge, it is unknown how many universities in the United States incorporate EE programming designed only for student-athletes. Our search did not reveal any universities which examined or evaluated the effects of these EE programs on student-athletes, in terms of increasing their environmental attitudes, behavioral intent, and knowledge.

Purpose Statement

In an effort to advance the environmental literacy of UGA student-athletes, this study examined the effects of an EE program on student-athletes' environmental attitudes, behavioral intent, and knowledge. Research indicates that enhancing students' environmental awareness and knowledge can help mitigate some academic risks, which is important to student-athletes, who are often perceived as being at risk for academic difficulties (Chemers et al., 2001; Gale, 2011; Hungerford et al., 2000; McMillan & Reed, 1994; Rickinson, 2001).

Research Objectives and Hypotheses

Research Objective 1: Evaluate the effects of an EE program on student-athletes' environmental attitudes, behavioral intent, and knowledge.

Null Hypothesis 1a: No statistically significant differences will exist between groups on the posttest or within individuals from pretest to posttest for UGA student-athletes in regard to environmental attitudes, behavioral intent, and knowledge.

Alternative Hypothesis 1b: Treatment group individuals will exhibit statistically significant increases in environmental attitudes, behavioral intent, and knowledge from pretest to posttest.

Alternative Hypothesis 1c: Treatment group mean scores on the posttest will be significantly different from control group scores in regard to environmental attitudes, behavioral intent, and knowledge.

Research Objective 2: Evaluate the effects of the student-athlete mentoring program on the academic orientations of student-athletes, in terms of their academic self-efficacy, motivation, and use of study strategies.

Null Hypothesis 2a: No statistically significant differences will exist between groups on the posttest or within individuals from pretest to posttest for academic self-efficacy, motivation, or use of learning strategies.

Alternative Hypothesis 2b: Treatment group individuals will exhibit statistically significant increases in academic self-efficacy, motivation, and use of learning strategies from pretest to posttest.

Alternative Hypothesis 2c: Treatment group mean scores on the posttest will be significantly different from control group scores in regard to academic self-efficacy, motivation, and use of learning strategies.

Methods

Survey

Treatment effects were measured using a survey, the Student-Athlete Environmental and Academic Orientations Survey (SEAOS). The SEAOS was constructed from existing items and new items. In the spring semester of 2014, a draft version of the SEAOS was piloted with UGA student-athletes. Following the pilot test, the researchers met with stakeholders, which included the Director of the Rankin Smith Student-Athlete Academic Center and the Mentor Coordinator at Rankin, to evaluate the survey and determine which modifications to make. The SEAOS was found to have high reliability (Cronbach's $\alpha > 0.7$) and validity (loadings > 0.5, eigenvalues > 1). The SEAOS was administered as a pretest-posttest to student-athletes in the study and contained 11 domains. More information regarding the SEAOS is available in Chapter 2.

SEAOS Pilot Test

Through the pilot test in the spring of 2014, eight constructs were identified: environmental attitudes, environmental behavioral intent, and academic self-efficacy, self-efficacy for self-regulatory learning, academic motivation, and use of learning strategies, attitudes toward mentoring, and attitudes toward tutoring. The Cronbach's alpha reliability coefficients for each construct are displayed in Table 3.1.

Treatment Group

Participants in this study were drawn from a convenience sample. All UGA student-athletes who were enrolled in the Athletic Association Academic Mentoring Program during the

Fall 2014 and Spring 2015 semesters were randomly assigned to either the treatment group or the control group using a random number generator. Two sports were made an exception; football and men's basketball student-athletes were excluded at the request of the stakeholders.

Table 3.1

Cronbach's Alpha Reliability Coefficients for SEAOS Scales

Scale	Cronbach's α
Attitudes toward Tutoring	0.98
Attitudes toward Mentoring	0.96
Academic Mentoring	0.97
Personal Relationship with Mentor	0.95
Academic Motivation	0.95
Self-Efficacy for Self-Regulatory Learning	0.95
Academic Self-Efficacy	0.93
Use of Learning Strategies	0.92
Environmental Behaviors	0.89
Individual Action	0.91
Collective Action	0.75
Environmental Attitudes	0.81

Treatment included participation in an EE-type curriculum, which occurred during the student-athletes' academic mentoring. The curriculum developed for this study was constructed using pedagogical tools and resources, which followed the guidelines of Constructivist Learning Theory, and consisted of lesson plans containing background information, discussion questions, and short activities. The lesson plans encompassed four sustainability-related topics: energy conservation, water conservation, waste reduction, and sustainable food systems. These topics were chosen in consultation with the Director of the Office of Sustainability (OS) at UGA. Following a meeting with the OS Director and a faculty member experienced in EE, lessons which addressed these four topics were selected from Project Learning Tree and Project WET curriculum guides (American Forest Foundation, 2006; Project WET International Foundation, 2010). The lessons were then modified to incorporate information about the local environment of Athens, Georgia and to include activities that fit the age group of the student-athletes. Additionally, some content was created using resources from the OS, including information about UGA's campus sustainability efforts and steps student-athletes could take to become more sustainable in their daily lives. The Guidelines for Excellence published by the North American Association for Environmental Education (NAAEE) were consulted to ensure each lesson met national EE standards. The six guidelines from NAAEE were consulted, with special emphasis placed on following the third and fourth guideline, because they were the most applicable to this study. The third NAAEE guideline states that "EE materials should build lifelong skills that enable learners to address environmental issues" (NAAEE, 2004). The fourth NAAEE guideline states that "EE materials should promote civic responsibility, encouraging learners to use their knowledge, personal skills, and assessments of environmental problems and issues as a basis for environmental problem solving and action" (NAAEE, 2004). Because the goal of the mentoring program and of EE is to spur responsible action, these guidelines were deemed the most appropriate to help guide development of EE resources. However, the Guidelines for Excellence were all consulted and informed construction of the curriculum. Additionally, lesson plan templates were utilized to provide continuity across the lessons, which were provided by a professional familiar with EE. These templates included spaces for background knowledge, activities, and transitions between lessons.

Once per week, mentors and student-athletes in the treatment group completed one of the EE lessons. Each lesson contained 10-15 PowerPoint slides and required 15-20 minutes to complete. Mentors and student-athletes read aloud the information and questions on each slide and engaged in a dialogue about the issue. Mentors were trained in administering the EE lessons and were asked not to deviate from the lesson script, except to discuss personal experiences with the topics, to provide consistency in treatment. Training occurred in the week before the semester began and lasted for one hour. Mentors were introduced to the research study and practiced administering a lesson to a partner. The lead researcher walked around the room during training to observe and provide assistance and suggestions where needed. Additionally, the lead researcher observed each mentor at least once during the study to gauge their teaching style and offer feedback.

EE Curriculum Pilot Testing

Thirteen lessons were developed and underwent pilot testing in the spring of 2014. A sample of 17 student-athletes who were enrolled in the mentoring program completed the pilot lessons with their mentors. Following pilot testing, stakeholders met with the lead researchers for a focus group to discuss ways to improve the curriculum. Assessment of the effectiveness of the pilot lessons was measured by the pilot SEAOS. Treatment group scores on the environmental attitudes scale of the pilot survey increased significantly, as measured by analysis of covariance, from pretest to posttest ($F(1, 39) = 5.476$, $p = 0.025$, $\eta^2 = 0.129$). Additionally, the treatment group experienced statistically significant increases in scores on the environmental behavioral intent scale ($F(1, 39) = 7.628$, $p = 0.009$, $\eta^2 = 0.171$), suggesting effectiveness of the lessons on influencing attitudes and behaviors. However, some adjustments were still necessary.

Results from the pilot test and the stakeholder focus group guided adjustments to the lessons to create a more feasible format for mentoring in a computer lab setting. The number of lessons was reduced to eight to ease burden on mentors and student-athletes. Content in some lessons was adjusted to align more closely with environmental literacy objectives and UGAAA mentoring program objectives. More information on ecology and policy was included, based on suggestions from EE literature (Chawla & Cushing, 2007; Hungerford & Volk, 1990), which posits that political participation and fundamental ecological knowledge can increase content relevancy and help fulfill EE goals. In addition, some content pertaining to transportation, which was originally a separate topic, was absorbed into the lessons in the energy topic. Based on mentor and student-athlete feedback from the pilot test, the transportation lessons were the least popular, student-athletes' knowledge levels about alternative transportation were found to be high in the pretest, and many issues surrounding transportation can be discussed in the context of energy (i.e., fossil fuel consumption). The adjustments were made to the pilot lessons and pilot SEAOS in the summer of 2014, and in Fall 2014 and Spring 2015, the final EE lessons and survey were administered to the study sample.

Sampling of the student-athletes for the treatment group was conducted using convenience sampling, as follows. Student-athletes who were enrolled in the mentoring program during this study were included in the sample. Two subgroups of student-athletes were excluded from participation in the study: "high-needs" student-athletes, who require learning support and were assigned to Learning Specialists instead of mentors, and student-athletes in football and men's basketball. Football and men's basketball student-athletes were excluded at the request of the stakeholders. All other student-athletes in the mentoring program were assigned randomly to either the treatment group or the control group using a random number generator.

Control Group

The control group did not receive any experimental treatment. Instead, the control group was enrolled in the standard mentoring program with no additional EE treatment. In the standard mentoring program at UGA, student-athletes are assigned a mentor for one semester. Mentors and student-athletes typically meet two to three times each week for hour-long sessions. During mentoring sessions, which occur in the Rankin computer lab, mentors assist student-athletes with time management through the use of calendars, agendas, and weekly task lists; provide study tips; and review class material. Mentors establish rapport with their student-athletes, act as role models, and provide them with assistance in balancing their academic and athletic responsibilities. Mentors are also encouraged to adapt their mentoring style to match the individual learning styles of their student-athletes; this strategy also aligns well with principles outlined in Constructivist Learning Theory, which further argues that mentoring was an appropriate venue for this study.

Analysis

Scores on the pretest and posttest SEAOS from both groups comprised the data for this study. To perform statistical analyses of the data, scale means from the 11 identified components in the SEAOS were used. All statistical tests were conducted using an alpha level of 0.05, however in two instances an alpha level of 0.10 was utilized to accommodate subtle differences in scores pretest to posttest. Differences between individuals from pretest to posttest were analyzed using paired samples *t*-tests. Differences between the treatment and control groups on the posttest were analyzed using analysis of covariance (ANCOVA) (Bentler, 1980). Chi-squared tests were conducted to confirm that no differences existed between groups among demographic variables, including academic year, age, ethnicity, gender, major, race, and sport (Gravetter & Wallnau, 2012). Both groups were found to be statistically similar for each of these variables. Results from chi-squared tests can be found in Table 3.4.

Table 3.4

Chi-squared Tests for Equality of Groups

	X^2	*df*	*p*
Academic Year	4.166	3	0.244
Age	8.776	4	0.067
Ethnicity	0.488	2	0.783
Gender	0.354	1	0.552
Major	4.227	5	0.517
Race	5.217	5	0.390
Sport	11.835	10	0.296

Results

Sample Characteristics

The treatment group was composed of 33 student-athletes, 20 (60.6%) of which were female, and 13 (39.4%) were male. This is similar to the gender distribution of undergraduate students at UGA, which is 57% female and 43% male ("College Profile: University of Georgia," 2015). The gender distribution of the UGA student-athlete population is 70% female and 30% male. Median age of the treatment group was 18 years old, and mean age was 18.4 years old. Fittingly, 31 (93.9%) student-athletes in the treatment group were freshmen, which is not representative of the distribution of UGA student-athletes as a whole but does represent student-athletes enrolled in the mentoring program. Freshmen student-athletes are required to receive mentoring, and after the first year many student-athletes are free to discontinue mentoring if it is determined they can handle balancing academics and athletics on their own, resulting in a population heavily consisting of freshmen. At the start of the study, 45 student-athletes completed a pretest survey, and the 33 student-athletes described here completed a posttest survey, yielding a response rate of 73.3%.

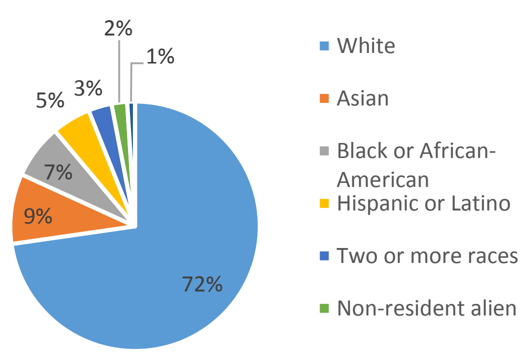

Figure 3.1. Racial Demographics of UGA students

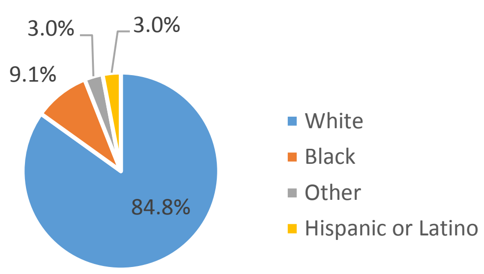

Figure 3.2. Treatment Group Racial Demographics

The treatment group contained mainly White, Not Hispanic/Latino student-athletes. The overall racial and ethnic demographics of UGA undergraduate students are shown in Figure 3.1, and the racial and ethnic demographics of the treatment group are shown in Figure 3.2.

A subset of SEAOS items also requested academic major, hometown, native language, and previous EE experience. Because UGA offers 170 different academic majors, six categories were created to organize majors in the study sample: humanities and arts, life sciences, pre-professional (e.g., pre-medicine, pre-business, and pre-law), quantitative reasoning, social sciences, and undecided. These categories were determined based upon classifications of university-wide required courses for all majors (University of Georgia Academic Bulletin, 2014). Sixteen student-athletes (48.4%) in the treatment group declared majors in social sciences and humanities and arts. The next most popular major category was pre-professional, with seven student-athletes (21.2%). Urban and rural classifications of hometowns were conducted using the U.S. Census Bureau's 2010 classification system (U.S. Census Bureau, 2010). The hometowns of the student-athletes in the treatment group consisted of 51.5% (17 student-athletes) urban areas, 30.3% (10 student-athletes) urban cluster areas, and 18.2% (4 student-athletes) rural areas. Only one student-athlete reported his native language was something other than English, which was Japanese.

Pretest environmental knowledge of the treatment group, measured by the number of questions out of 10 student-athletes answered correctly, was on average 63.6% correct. Only three student-athletes (9.1%) in the treatment group had taken an environmentally-related course at UGA (e.g., ecology, natural resources, environmental health) for credit, and only three student-athletes (9.1%) had previously enrolled in an EE program somewhere outside UGA (e.g., at a nature center or park). Pretest environmental attitudes and behaviors for the treatment group can be found in Tables 3.2 and 3.3 in Appendix C.

The control group consisted of 31 student-athletes who were enrolled in UGAAA's mentoring program. Twenty-one (67.7%) student-athletes in the control group were female, and ten (32.3%) were male, which is similar to the gender distribution of the UGA student-athlete population in this study. Median age was 18.5 years old, and 24 (77.4%) control group student-athletes were freshmen. Like the treatment group, the control group was also primarily White and Not Hispanic or Latino student-athletes. Figure 3.3 displays the racial and ethnic demographics of the control group. The racial distribution can be compared to Figure 3.1, which displays the racial and ethnic demographics of all UGA undergraduates. Five student-athletes reported speaking a native language other than English: Japanese (2), Spanish (2), and Swahili (1).

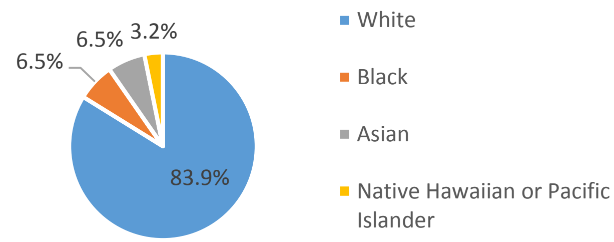

Figure 3.3. Control Group Racial and Ethnic Demographics

Twelve (38.7%) student-athletes in the control group declared majors in the social sciences. The next two most popular major categories were pre-professional and humanities and arts, with seven student-athletes (22.6%) each. The control group thus contains fewer student-athletes with majors in life sciences and quantitative reasoning than the treatment group. Seventeen (54.8%) student-athletes in the control group were from urban areas; twelve (38.7%) were from hometowns classified as urban clusters, and two (6.5%) were from rural areas. Additionally, the average percentage of correct responses to the ten environmental knowledge questions on the pretest was 62.3% correct. Furthermore, 32.3% of the control group reported they had previously enrolled in environmentally-related courses at UGA for credit, and 29% reported they had previous experience in EE programs outside UGA. The control group thus had higher rates of previous experience with EE or other environmentally-related information than the treatment group. Pretest environmental attitudes and behaviors for the control group are available in Tables 3.2 and 3.3 in Appendix C. At the start of the data collection period, 60 student-athletes in the control group completed a pretest survey, and the 31 student-athletes described here completed the posttest survey, yielding a response rate of 51.7%.

Treatment Effects

Paired samples *t*-tests were conducted to detect differences among individuals from pretest to posttest. Effect size was determined using partial eta squared, and reported strength followed the guidelines proposed by Cohen (1988) (Levine & Hullett, 2002). Significant improvements were found for environmental behaviors ($t = 2.34$, $p = 0.026$) and academic self-efficacy ($t = 2.07$, $p = 0.047$).

For environmental behaviors, the strength of the relationship, as measured by partial eta squared, was large and accounted for 14% of the variance in the sample scores. For academic self-efficacy, the strength of the relationship was medium and accounted for 12% of the variance. Additionally, within environmental behaviors, the collective action component (t = -2.53, p = 0.017) revealed a significant improvement. The effect size was large and accounted for 17% of the variance. No statistically significant differences were detected for self-efficacy for self-regulatory learning, motivation, or use of learning strategies.

Despite having equal environmental knowledge levels as the treatment group on the pretest, the control group experienced statistically significant increases in environmental knowledge from pretest to posttest (t = -2.90, p = 0.007, est η^2 = 0.22), which was unexpected. However, the control group consisted of a larger portion of students who enrolled in environmentally-related courses during the semester in which they participated in the study than the treatment group. Ten (32%) student-athletes in the control group were enrolled in courses such as ecology, and only three (9%) student-athletes in the treatment group were enrolled in such courses. Post-hoc chi-squared tests revealed that the proportion of participants who had prior EE courses and prior EE program experience in the two groups were significantly different (X^2_{course} = 5.30, p = 0.021; X^2_{program} = 4.17, p = 0.041). This disparity could be partially responsible for the unexpected differences seen in environmental knowledge in the control group. Mean control group posttest knowledge was 69.0% correct, and mean treatment group posttest knowledge was 69.4% correct. Results from the paired-samples *t*-tests from the treatment and control groups can be found in Tables 3.5 and 3.6, respectively. However, due to the absence of other aspects of EE treatment in the control group, such as activities, discussion, and engagement in EE material, they did not experience an increase in environmental attitudes or behaviors from pretest to posttest.

Table 3.5

Treatment Effects Using Paired-samples T-tests for Treatment Group (n = 33)

	Pretest		Posttest			
	M	*SD*	*M*	*SD*	*t*-test	Partial η^2
Environmental Attitudes	4.05	0.58	4.25	0.68	-1.83*	0.09
Environmental Behavioral Intent	3.26	1.06	3.70	0.68	-2.34**	0.14
Individual Action	3.45	1.12	3.91	0.79	-2.08*	0.12
Collective Action	2.67	1.07	3.17	0.85	-2.53**	0.17
Academic Self-Efficacy	5.09	1.50	5.57	1.07	-2.07**	0.12
Self-Efficacy for Self-Regulatory Learning	5.48	1.47	5.51	1.15	-0.13	--
Academic Motivation	5.24	1.46	5.32	1.14	-0.42	--
Use of Learning Strategies	4.92	1.37	5.03	1.20	-0.59	--
Environmental Knowledge	6.36	1.69	6.94	3.41	-0.93	--

*$p<0.10$, **$p<0.05$

Table 3.6

Treatment Effects Using Paired-samples T-tests for Control Group (n = 31)

	Pretest		Posttest			
	M	*SD*	*M*	*SD*	*t*-test	Partial η^2
Environmental Attitudes	3.85	0.82	3.98	0.70	-0.88	--
Environmental Behavioral Intent	3.37	0.76	3.50	0.75	-1.12	--
Individual Action	3.63	0.80	3.71	0.82	-0.55	--
Collective Action	2.63	0.92	2.87	0.93	-1.49	--
Academic Self-Efficacy	5.09	1.19	5.23	1.13	-0.79	--
Self-Efficacy for Self-Regulatory Learning	5.35	1.40	5.18	1.14	1.03	--
Academic Motivation	4.93	1.30	4.87	0.97	0.295	--
Use of Learning Strategies	4.84	1.18	4.87	1.09	-0.20	--
Environmental Knowledge	6.23	1.23	6.90	1.11	-2.90**	0.22

**$p<0.05$

Analyses of covariance were conducted to detect differences between groups on the posttest, however no significant differences were found for any construct. Results from the ANCOVAs can be found in Table 3.7. The “individual action” and “collective action” subcomponents of behavioral intent violated the assumption of homogeneity of regression slopes, so ANCOVAs are not reported for those items. As previously mentioned, more student-athletes in the control group had prior EE experience than the treatment group, and this may have contributed to unequal groups.

Table 3.7

Analysis of Covariance Summary for SEAOS Constructs (n = 64)

Source	*SS*	*df*	*MS*	*F*	*p*
Environmental Attitudes	0.497	1	0.497	1.271	0.264
Academic Self-Efficacy	1.776	1	1.776	2.076	0.155
Self-Efficacy for Self-Regulatory Learning	1.273	1	1.273	1.362	0.248
Academic Motivation	0.170	1	0.170	0.243	0.624
Use of Learning Strategies	1.438	1	1.438	1.979	0.165
Environmental Knowledge	0.002	1	0.002	<0.001	0.987

Overall, the EE treatment had an effect on treatment group student-athletes' intent to engage in pro-environmental behaviors and academic self-efficacy. However, the treatment failed to significantly influence environmental attitudes, environmental knowledge, or other academic constructs.

Mentoring and Tutoring

Paired samples *t*-tests were conducted to detect differences among individuals from pretest to posttest. No significant differences were detected for any mentoring or tutoring constructs. In some cases, pretest scores were higher than posttest scores, though not significantly. Mean scores were consistently above the neutral point, and the control group responded above four on a five-point scale for all four components, leaving little room for improvement on the posttest. Results from paired *t*-tests for treatment and control groups are shown in Tables 3.8 and 3.9, respectively.

Table 3.8

Treatment Effects Using Paired-samples T-tests for Treatment Group (n = 33)

	Pretest		Posttest		
Scale	*M*	*SD*	*M*	*SD*	*t*-test
Attitudes Toward Mentoring	3.99	0.53	3.90	0.81	0.65
Effectiveness of Mentoring	4.25	0.58	4.17	0.75	0.51
Relationship to Mentor	3.86	0.60	3.76	0.89	0.72
Attitudes Toward Tutoring	4.09	0.70	4.20	0.63	-0.83

Table 3.9

Treatment Effects Using Paired-samples T-tests for Control Group (n = 31)

	Pretest		Posttest		
Scale	*M*	*SD*	*M*	*SD*	*t*-test
Attitudes Toward Mentoring	4.28	0.55	4.30	0.63	-0.21
Effectiveness of Mentoring	4.20	0.62	4.18	0.74	0.21
Relationship to Mentor	4.44	0.55	4.56	0.52	-0.93
Attitudes Toward Tutoring	4.09	0.70	4.20	0.63	-0.83

Analysis of covariance was conducted to detect differences between groups on the posttest, while controlling for pretest scores. Mean scores for the component “relationship to mentor” increased significantly from pretest to posttest, though not for the predicted group; the control group reported significantly higher responses on the posttest than the treatment group ($F(1, 63) = 4.38$, $p = 0.04$). The strength of the relationship, as measured by partial eta squared, was medium and accounted for 7% of the variance in scores. The attitudes toward tutoring construct violated the homogeneity of regression slopes assumption, thus ANCOVA is not reported for this construct. Other components did not experience significant differences. Results from ANCOVAs are shown in Table 3.10. Overall, the EE treatment did not appear to significantly influence student-athletes’ attitudes toward mentoring or tutoring, but the student-athletes in the control group appeared to experience an improvement in their relationship with their mentor over the course of the semester.

Table 3.10

Analysis of Covariance Summary for SEAOS Constructs (n = 63)

Source	*SS*	*df*	*MS*	*F*	*p*	Partial η^2
Attitudes Toward Mentoring	0.659	1	0.659	1.593	0.212	--
Effectiveness of Mentoring	0.357	1	0.357	0.778	0.381	--
Relationship to Mentor	1.823	1	1.823	4.381	0.041**	0.07

**p<0.05

Discussion and Conclusions

University student-athletes have historically been underrepresented in majors that explore environmental topics (Fountain & Finley, 2011). This disparity has mirrored a decline in environmental awareness in U.S. adolescents and a decline in the concern for the future of natural resources since the early 1990s (Wray-Lake, Flanagan, & Osgood, 2010). Therefore, this study attempted to bridge the gap between university student-athletes and environmental content. The means of influencing environmental attitudes and behaviors in student-athletes in this study was environmental education (EE), a traditional method of acquiring environmental knowledge (Roth, 1992). One of the purposes of this study was to observe the effects of EE programming through academic mentoring on the environmental orientations, environmental knowledge, and academic orientations of student-athletes. The instrument used in this study to observe treatment effects on student-athletes was the Student-Athlete Environmental and Academic Orientations Survey (SEAOS). A second purpose of the study was to evaluate the effectiveness of the student-athlete academic mentoring program at UGA, which was also evaluated with the SEAOS.

Research Objective 1

The treatment group and the control group were statistically similar initially in regard to academic major, age, ethnicity, gender, pretest environmental knowledge, race, and sport. After treatment, there were statistically significant increases in the treatment group in collective pro-environmental behaviors. Additionally, the treatment group experienced statistically significant increases in two components, environmental attitudes and individual environmental behaviors, using a more liberal alpha level of 0.10. Given that demographic variables in the two groups were equal, the significant findings suggest EE-based mentoring contributed to positive effects in treatment group participants. Thus, we were able to reject our null hypothesis that no change would take place within individuals. Despite more prior experience with EE than the treatment group, the control group had the same initial levels of environmental attitudes and behaviors, and yet did not exhibit an increase in attitudes or behaviors, further indicating the efficacy of the EE treatment. However, we retain our null hypothesis regarding differences between groups on posttest scores, as ANCOVAs did not reveal significant results.

One notable finding was statistically significant improvement in the “collective action” subcomponent in treatment group participants. Many pro-environmental behaviors that require interaction or collaboration with others can be difficult to encourage, even though some collective actions can have a greater positive impact on the environment than individual actions. Hence, this was an encouraging finding, considering the unique capacity of student-athletes to reach out to teammates and admiring students regarding pro-environmental behaviors. Certain teams have substantial visibility which can help promote efforts at UGA to cultivate a culture of sustainability on campus.

Modest improvements in environmental attitudes and individual actions were also recorded. While statistically significant improvement at the alpha level of 0.05 was preferred, it is possible that attitudes were already at a high enough level to lead to behavioral change, and thus a larger improvement was unlikely. Additionally, some student-athletes indicated on the pretest they already performed some of the individual actions listed on the SEAOS. Therefore, an increase in these behaviors may not necessarily be reflected in survey responses.

Some observations in similar studies align with the results of this study. Roczen, Kaiser, Bogner, and Wilson (2014) stated attitudes toward nature were a better predictor of pro-environmental behavior than environmental knowledge. This study provides further support of this relationship, given that environmental knowledge did not increase significantly, though environmental attitudes and behaviors did. Similarly, EE interventions that are most effective at influencing pro-environmental behaviors actively involve their participants in activities and discussions (Zelezny, 1999). The positive results of this study may have been due to the deliberately planned discussions and activities that were actively aimed at engaging student-athletes and followed guidelines proposed by CLT.

Research Objective 2

The treatment group experienced significant improvements from pretest to posttest for one academic SEAOS component: academic self-efficacy. Thus, we rejected our null hypothesis that no differences would be seen within individuals. Although no improvements were observed for other academic components, an increase in academic self-efficacy is an important first step. Establishing a belief that one can achieve success in school is a critical prerequisite for actual success in school. Since most student-athletes who participated in this study were freshmen, it is possible they had not yet developed the subsequent academic self-concepts beyond self-efficacy. Self-regulatory learning, motivation, and use of learning strategies are skills developed over time through the help of multiple semesters of coursework and mentorship, so developing self-efficacy with the help of EE-based mentoring is an important success for the treatment group in this study. Additionally, we retained our null hypothesis that no changes would be seen between groups on the posttest.

Significant findings toward the second research objective also hold implications for other tutoring programs on campus and for Athletic Association-sponsored mentoring programs at other universities. The EE curriculum was developed for this study and thus contained place-based information and activities. However, the method for developing the curriculum and basic outline were strategically designed so they could be utilized by other universities. The four environmental content topics can apply to any geographic region or university culture; water resources, energy, food, and waste management are issues that can be explored across the country. Additionally, the structure and format of the EE lessons in this study can serve as a template for other programs at UGA and at other universities. Furthermore, the mentoring setting in which the EE lessons took place may have influenced the significant increases in pro-environmental behaviors in the treatment group in this study, suggesting the one-on-one nature of EE administration may have been an important component of the treatment. If other universities decide to adopt an EE-type program with their student-athletes, mentoring is a recommended setting for such a program.

Overall, this study did not observe significant increases in mean scores of attitudes toward mentoring or tutoring, except for the control group which reported an improvement in relationships with their mentors over the course of the semester. Mean scores on academic items were above the neutral point for both groups on the pretest, thus improvement on scores that were at high levels initially may not have been possible to achieve in a single semester. Additionally, some pretest scores regarding attitudes toward mentoring and tutoring were below the neutral point, suggesting their initial feelings about being enrolled in mentoring were slightly negative. A hesitancy toward spending a semester working with a mentor may have subtly and negatively influenced their engagement and hindered the efforts of the mentors. Unfortunately, posttest scores did not reflect an improvement in attitudes toward mentoring, but mean scores on academic items remained above the neutral point, indicating positive academic orientations already existed in both groups.

Many of the student-athletes in this study had little or no prior experience with academic mentoring at UGA and therefore may not have had enough experience with mentoring to change their attitudes or self-concept, which could potentially explain the paucity of significant improvements in these constructs. Moreover, high initial scores leave little room for significant improvements, especially given the scope and scale of this study.

Similar research has been found in the literature on academic outcomes of EE. A literature review by Williams and Dixon (2013) found that garden-based learning had positive impacts on academic outcomes in many studies. Another similar study conducted by Stern, Powell, and Ardoin (2010) revealed positive short-term gains in attitudes toward school of students who participated in an EE program. However, more research is needed to study long-term impacts on students' academic orientations.

Generally, this study effectively addressed both research objectives, and provided evidence of the need for and values of EE programs with university student-athletes. However, some limitations to the study methodology and outcomes should be noted.

Limitations

Some aspects of this study may have limited the robustness of the results, including the length of the study, method of data collection, and sample size. The evaluation of the effectiveness of mentoring and tutoring took place in a single 16-week semester and was measured by pretest-posttest surveys. Although no statistically significant differences were seen from pretest to posttest in the treatment group, the scale of the study may have limited observations of possible outcomes. One semester may not be enough time for change to occur in attitudes toward mentoring. However, there were statistically significant improvements in the control group in regard to their relationship with their mentors. The control group did not spend more time with their mentors each week than the treatment group, yet this group was able to spend some time in their sessions on activities that establish rapport, as they were not required to complete EE lessons within their sessions. It is possible that with increased time over multiple semesters, UGA can achieve positive relationships between student-athletes and their mentors.

The length of the SEAOS may not have been conducive to honest, sincere responses. For some participants, the majority of a one-hour mentoring session was necessary to complete the survey. The number of items may also have contributed to response fatigue, leading some participants to circle a series of items at once instead of answering each item honestly and individually. Moreover, the posttest was completed by many student-athletes in between final exams due to its occurrence at the end of the semester, which may have led to rushed or distracted responses. However, similar grievances about the posttest occurred in both semesters of the study as well as in the pilot test, so any confounding effect on posttest responses was experienced consistently throughout the study. As with any survey-based research, self-reported survey responses are subject to social desirability bias. Student-athletes may have responded the way they perceived researchers wanted them to respond, possibly skewing data. In an effort to reduce social desirability bias, researchers were not present when student-athletes completed surveys, and efforts were made to include neutral wording in SEAOS items.

Further, some mentors expressed difficulty finding time to complete the EE lessons in their weekly schedule with their students. This issue was partially addressed when a minimum number of lessons was instated, and when lessons were divided from eight 20-minute lessons to sixteen 10-minute lessons, but some mentors still struggled to complete each lesson. If mentors felt rushed while administering the EE lessons, this may have dampened the efficacy of the message. Additionally, rhetoric may be equally important as content; if mentors were unable to connect to the material and share their opinions on these issues, then students could be less likely to connect with the material. It may be beneficial in future studies, therefore, to assess the environmental values and attitudes of the mentors in addition to applying common scripts and discussion questions.

Another potential limitation to robustness of the data is the small size of the sample. The study was restricted to student-athletes enrolled in the mentoring program, who were not on the football or men's basketball teams, and who had not previously been in the study. Moreover, study participants were selected from a convenience sample of student-athletes who were already enrolled in the UGAAA mentoring program. As a result, subgroups were not analyzed because fewer than the widely-accepted minimum of 30 participants were in each subgroup of interest, such as academic year, gender, prior EE experience, and race. The small sample size may also have been the reason some ANCOVAs violated assumptions and consequently were not conducted. Generalizability to other programs increases as sample size increases, so further studies should include student-athletes enrolled in tutoring as well as mentoring to increase sample size. Additionally, the study sample was not representative of student-athletes in regard to academic year; a larger proportion of the sample consisted of freshmen than is characteristic of student-athletes at large. As mentioned previously, the study sample was similar to the racial and ethnic demographics of UGA undergraduates, though the sample had a slightly higher proportion of White, Non-Hispanic student-athletes. A larger sample size may have corrected these demographic anomalies.

Efforts were made to provide equal treatment to all participants, including scripted PowerPoints, identical sets of discussion questions, and identical activities for each participant. All mentors were trained in administering the EE lessons, and each mentor was observed during the semester to detect any deviations from the provided script. Yet, equal deliverance of the treatment cannot be ensured, because some mentors may be more interested in the material, and thus more enthusiastic, than others. Discussions questions can be identical, but discussions themselves cannot be identical; likewise, activities can be identical, but engagement in activities cannot be equal. However, the benefits of personalized, one-on-one mentoring may outweigh the cost of ignorance about whether each participant’s experience with EE was equal.

Though the development of the EE curriculum followed national EE standards, the constraints of mentoring in the Rankin computer lab were unavoidable. Environmental knowledge was presented to student-athletes through mentors explaining content from scripted PowerPoints. In future studies, allowing for more time to engage in EE could help ameliorate this issue. However, modest results in this study may be due to other factors, such as small sample size, than to EE curriculum, as there were moments of active discussion and activity included in each lesson.

This study provided a foundation for future studies of EL with university student-athletes. Future efforts to improve EL in student-athletes are encouraged and should continue to focus on improving academic outcomes as well. Improvement in environmental attitudes, behaviors, and knowledge of student-athletes can dissipate throughout their teams and into the student body. Through extracurricular EE programs, such as the one presented in this study, a population of university students that is frequently under reached by environmental knowledge can improve their EL and contribute to the sustainability efforts of universities.

CHAPTER 4

CONCLUSIONS

University graduates face a future of complex environmental issues. Combating these issues will require an array of environmental knowledge, skills, and values. University classes are often a main source of environmental knowledge and skills for college graduates (Fritz, Omar, & Kallis, 2013). Environmental literacy (EL) requirements at some universities seek to foster an understanding of basic environmental knowledge and the skills necessary to think critically about a variety of global issues (Eagan & Orr, 1992). However, not all EL requirements result in environmental literacy. At universities such as the University of Georgia (UGA), some classes which qualify for fulfillment of the EL requirement do not necessarily produce environmentally literate students. Thus, extracurricular environmental education experiences are needed to fill gaps in environmental knowledge and provide needed skills (Moody & Hartel, 2007).

Moreover, some university students, in particular university student-athletes, are disproportionately underexposed to environmental knowledge. Due to their demanding schedules and other academic challenges, student-athletes often lack the time to pursue extracurricular involvement, some of which includes opportunities to learn about and help solve environmental problems (Carodine et al., 2001). In addition, few student-athletes pursue majors in the sciences, where most environmental content is taught (Fountain & Finley, 2011). These two issues result in a group of university students who need extra assistance to achieve EL. The large environmental impact of university sports also emphasizes the need for an environmentally literate population of student-athletes (Mallen et al., 2010).

This study underlined a need to connect university student-athletes to environmental knowledge and skills and provided an opportunity to make that connection. A sample of student-athletes at UGA was able to improve their environmental orientations through EE-based academic mentoring. While environmental knowledge of student-athletes did not increase in this study, their environmental attitudes and intent to engage in pro-environmental behaviors did increase. Since intent to engage in pro-environmental behaviors is a prerequisite to EL, this study helped student-athletes take an incremental step toward EL. While the sample size was small, some conclusions and implications could be drawn from the results. Through this study, three research objectives were reached.

Research Objective 1

The Student-Athlete Environmental and Academic Orientations Survey (SEAOS) was constructed and validated. The survey was pilot tested, revised, and administered to the study sample. Results indicated that two structural changes to survey components occurred during final survey implementation, as discussed in Chapter 2. Items in the environmental behavior scale loaded onto two components labeled Collective Action and Individual Action. Also, items in the mentoring scales loaded onto two components labeled Academic Mentoring and Relationship to Mentor. These new components provided supplementary information regarding student-athletes' environmental behaviors and mentoring relationships. Based on Cronbach's alpha values and high factor loadings with no cross-loadings, the SEAOS was deemed a reliable and valid measure of student-athletes' environmental and academic orientations. Null hypotheses were thus rejected based on these values.

Research Objective 2

The EE programming with university student-athletes was evaluated using the SEAOS. The EE curriculum developed for this study and administered within the UGA mentoring program led to an increase in reported environmental behaviors and a slight increase in environmental attitudes among student-athletes in the treatment group. However, significant differences were not seen from pretest to posttest for all components measured by the SEAOS. Therefore, this study provided several new research questions, as outlined in subsequent sections, which could be explored in future studies.

Research Objective 3

In this study, the treatment group, which received EE treatment and mentoring, exhibited a statistically significant increase in academic self-efficacy from pretest to posttest. This was an important finding due to the vital role of self-efficacy in the development of future academic skills and motivation. Because of this, a null hypothesis, which stated no change would exist within individuals, was thus rejected. However, an additional null hypothesis, which stated no change would exist between groups on the posttest, was retained.

Applicability of the Study

Other universities can reference the EE curriculum used in this study to implement similar programs and utilize the SEAOS to evaluate their programs. Given that many universities provide academic mentoring and tutoring services to student-athletes, universities willing to implement a similar EE program could see similar positive results. The design of the EE program allows other institutions on campus and beyond to utilize the curriculum. Additionally, the SEAOS was shown to be a valid and reliable measure of the constructs of interest, based on high

Cronbach's alpha values and high factor loadings. Therefore, future studies which investigate similar EE outcomes may use the SEAOS with confidence.

An additional implication of this study relates to academic support services provided to student-athletes. Among National Collegiate Athletic Association (NCAA) Division I universities, many academic support services are alike, which allows these universities to share resources (NCAA, 2015). The SEAOS captures academic orientations of student-athletes in regard to self-efficacy, self-regulatory learning, motivation, and use of study strategies. Many of these orientations are referenced in universities' academic support service goals (Auburn University, 2015; Clemson University, 2015; University of Florida, 2015). Therefore, the SEAOS may have applicability beyond UGA. Furthermore, as the UGA mentoring program may be similar to that of other universities, the results presented in this study may encourage neighboring universities to perform evaluations of their own programs.

Limitations and Recommendations

Due to the limitations of this study, some recommendations for future research are provided, including the use of field activities, expansion into other academic support services, and modified sampling methods. Future studies may want to investigate EE-based field trips in association with SEAOS constructs. Hands-on EE activities in the field have been shown to be effective in improving students' interest, academic motivation, and critical thinking skills (Poudel et al., 2005). The curriculum developed for this study contained some place-based content, but was restricted to a computer lab setting, which may have limited the impacts the content could have had on student-athletes' learning. Hence, place-based activities may see further success in the field versus the indoors.

Additionally, similar EE curricula may be introduced into Athletic Association-sponsored tutoring and writing help. Given the successes of the EE-based mentoring program in this study, a similar program could also work in a tutoring or writing center setting. Furthermore, future research should seek to recruit a larger sample to examine differences between groups such as academic major, age, gender, race/ethnicity, or sport. Some differences may exist between such groups, yet this study was unable to detect them. Differences between groups may have a confounding effect or otherwise influence the efficacy of EE, nonetheless any differences cannot be ascertained without further studies with larger samples.

In addition to evaluations of student-athlete orientations, it may be helpful to measure orientations of mentors and tutors as well. The values and attitudes of mentors and tutors may influence delivery of EE curricula and therefore skew results. Hence, mentors and tutors may be screened before the study with a pretest values and attitudes evaluation to help control for any unintended effects. Finally, future studies may actively recruit student-athletes in their third or fourth year of college to measure the attitudes of students who have had multiple semesters of experience in mentoring and tutoring, as opposed to primarily sampling freshmen and sophomores. This modified sampling may return stronger results of attitudes toward mentoring and tutoring and may capture any long-term effects of academic support services that are not observed after a single semester. With the help of the EE curriculum designed in this study and the SEAOS, these research questions can be answered.

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Appendix A – Principal Components Analysis Tables

Table 2.5

Kaiser-Meyer-Olkin (KMO) Measure of Sampling Adequacy and Bartlett's Test of Sphericity for SEAOS Scales

		Bartlett's Test		
Source	KMO	Approximate X^2	df	*p*
Environmental Attitudes	0.72	264.17	15	<0.001
Environmental Behaviors	0.84	353.46	45	<0.001
Academic Self-Efficacy	0.81	575.07	28	<0.001
Self-Efficacy for Self-Regulatory Learning	0.88	516.17	28	<0.001
Academic Motivation	0.90	568.81	36	<0.001
Use of Learning Strategies	0.83	555.69	66	<0.001
Attitudes Toward Mentoring	0.86	1119.46	78	<0.001
Attitudes Toward Tutoring	0.93	1621.55	105	<0.001

Table 2.8

Component Matrix Coefficients for Principal Components Analysis using Oblimin Rotation of Single-Component Solution for Pre- and Posttest SEAOS

Component	Item	Pretest (*n* = 140)	Posttest (*n* = 64)
Environmental Attitudes	5	0.536	0.833
	4	0.720	0.769
	3	0.451	0.762
	1	0.727	0.751
	2	0.784	0.725
	6	0.759	0.660
Academic Self-efficacy	3	0.881	0.916
	2	0.873	0.892
	8	0.873	0.833
	1	0.855	0.888
	7	0.841	0.820
	5	0.803	0.893
	4	0.694	0.696
	6	0.668	0.678
Self-Regulatory Learning	7	0.916	0.858
	4	0.910	0.821
	3	0.909	0.893
	5	0.905	0.941
	2	0.900	0.863
	6	0.894	0.932
	1	0.879	0.753
	8	0.873	0.855

Table 2.8 (cont.)

Component Matrix Coefficients for Principal Components Analysis using Oblimin Rotation of Single-Component Solution for Pre- and Posttest SEAOS

Component	Item	Pretest (n = 140)	Posttest (n = 64)
Motivations	6	0.936	0.793
	8	0.936	0.915
	3	0.933	0.832
	4	0.917	0.882
	1	0.901	0.875
	7	0.872	0.816
	5	0.866	0.793
	2	0.854	0.875
	9	0.829	0.872
Use of Learning Strategies	1	0.857	0.834
	7	0.844	0.802
	10	0.804	0.775
	6	0.803	0.753
	4	0.799	0.803
	8	0.797	0.818
	11	0.793	0.669
	9	0.773	0.757
	3	0.766	0.646
	2	0.759	0.814
	12	0.721	0.765
	5	0.698	0.525
Attitudes Toward Tutoring	14	0.889	0.959
	15	0.878	0.908
	9	0.868	0.928
	8	0.864	0.945
	12	0.858	0.879
	4	0.850	0.928
	13	0.849	0.940
	1	0.843	0.919
	7	0.839	0.879
	2	0.838	0.921
	10	0.830	0.936
	5	0.822	0.938
	6	0.797	0.910
	11	0.740	0.908
	3	0.638	0.839

Appendix B – SEAOS Modifications

Table 2.2

Modifications to Final SEAOS Following Pilot Testing

Items Removed	Item Reworded	Item Added
I need plants to live.	Original: I am confident I can understand material presented in my class readings	I am confident I can prepare an outline for a term paper.
People need to take better care of plants and animals.	Modified: I am confident I can understand my class readings.	
I need to take better care of plants and animals.		
I would give some of my own money to help the environment.		
I would be willing to use efficient light bulbs to save energy.		
I recycle some of the things I use.		
I am confident I can do well on my exams.		
I am confident I can do well on pop quizzes.		
I am confident I can take good class notes.		
I am confident I can effectively balance time between schoolwork and athletics.		
When I study, I go through readings and class notes and try to find the most important ideas.		
I make good use of study time.		
I make simple charts, diagrams, or tables to help organize class material.		
When I study, I pull together information from different sources, such as lectures, readings, and discussions.		
I ask the instructor to clarify materials that I don’t understand.		
When I study, I write brief outlines of the main ideas from the readings and class notes.		
I attend class regularly.		
I make sure that I keep up with the weekly readings and assignments for class.		

Appendix C – Pretest Environmental Attitudes and Behaviors

Table 3.2

Pretest Environmental Attitudes for Treatment and Control Groups

	Treatment			Control		
Item	N	*M*	*SD*	N	*M*	*SD*
1	45	4.38	0.61	60	4.40	0.87
2	45	3.73	1.05	60	3.32	1.28
3	45	4.44	0.89	60	4.50	1.11
4	45	3.47	1.14	60	3.43	0.96
5	45	4.44	0.84	60	4.43	1.01
6	45	3.73	1.10	60	3.37	1.33

Response options to environmental attitudes items were on a Likert-type scale ranging from 1=*Strongly Disagree* to 5=*Strongly Agree.*

Table 3.3

Pretest Environmental Behaviors for Treatment and Control Groups

	Treatment			Control		
Item	N	*M*	*SD*	N	*M*	*SD*
1	45	3.24	1.23	60	3.50	0.95
2	45	3.49	1.25	60	3.68	0.93
3	45	3.60	1.10	60	3.35	1.26
4	45	4.00	1.02	60	4.08	0.81
5	45	2.73	1.30	60	2.53	1.02
6	45	3.80	1.32	60	3.88	1.06
7	45	2.80	1.27	60	2.75	1.10
8	45	2.58	1.20	60	2.35	1.01
9	45	3.11	1.53	60	3.37	1.19

Response options to environmental behavior items were on a Likert-type scale ranging from 1=*Strongly Disagree* to 5=*Strongly Agree.*