AN EXPLORATION OF CONNECTEDNESS TO NATURE IN TEENS AFTER PARTICIPATION IN AN EXPEDITIONARY SCIENCE PROGRAM

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ABSTRACT

Connectedness to nature is a measure of how strongly a person feels a part of nature. Research shows that young people who grow up in nature feel more strongly connected to it. Today, urbanization and technology can interfere with young people's connectedness to nature. Lack of connectedness to nature affects environmental sensitivity and could detract from pro-environmental behavior. Studies find that environmental education (EE) enhances connectedness to nature in youth. Expeditionary science programs like MYLES of Science (MYLES) immerse teens in nature and teach EE and field science. In 2016, 57 MYLES teens (n=57) were surveyed for pre- and post- connectedness to nature scores. The Connectedness to Nature Scale (CNS) and three open-ended questions were used to collect data. Results showed that CNS scores from MYLES participants had an increase of significance. Open-ended questions revealed nature immersion and wildlife experiences as the most noted causes of increased connectedness to nature.

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CHAPTER 1.

INTRODUCTION

Connecting with nature is an important part of human development, as nature nurtures human happiness and mental wellbeing (Bratman, Hamilton, & Daily, 2012; Logan & Selhub, 2012; Nisbett, 2011). Nature is known in Germany as a remedy for anxiety and studies there have shown that walking and simply sitting in nature can lower blood pressure, lower pulse rate, and lower heart rate in stressed adults (Logan & Selhub, 2012). Children develop their senses by interacting with nature and by being in natural environments (Wilson, 1997). Studies show that people make lifelong connections to the environment by spending time in nature during youth (Chawla, 1999; Kals, Schumacher, & Montada, 1999). Nature connections follow people into adulthood, and nature-experienced children often become pro-environmental adults (Beery & Wolf-Watz, 2014; Chawla, 1999; Kals et al., 1999). Being able to relate to nature and accept nature as a part of the human self is a concept known as connectedness to nature (Mayer & Frantz, 2004).

Aldo Leopold described the idea of people declaring war on nature by being disconnected from it (Leopold, 1949). There are many ways humans can be disconnected from nature, including living in urban settings (Bratman et al., 2012), being inside more often (Sobel, 2008) and relying on technology (Bratman et al., 2012; Gomes, 2012). A disconnect from nature contributes to stress, depression, and anxiety in humans (Bratman et al., 2012; Logan & Selhub, 2012; Nisbett, 2011). Youth acquire sensitivity to nature by having direct sensory experiences in nature (Metzger & McEwen, 1999; Wilson, 1997). Therefore it is important for children to build a relationship with nature so they can make informed environmental decisions later in life (Goleman, Bennett, & Barlow, 2012).

Statement of Need

Nature experiences, as a part of youth, contribute to adults becoming career conservationists and environmentalists (Chawla, 1999). A few studies found that nature connections were made because of being outside, even during the teenage years (D'Amato & Krasny, 2011; Kals et al., 1999). Studies show that being connected to nature is healthy for humans (Logan & Selhub, 2012). If urbanization and technology are interfering with humans' nature connections, people might have to work harder to make nature connections for themselves and for children (Sobel, 2008). Haluza-Delay (2001) concluded there is a need to connect teens with nature so they can figure out what nature means to them and/or how they fit with nature.

Participation in nature programming is an important way to strengthen human-nature bonds (Johnson-Pynn, Johnson, Kityo, & Lugumya, 2014). Weeklong outdoor EE programs increased children's connectedness to nature in several studies (Ernst & Theimer, 2011; Lieflander, Frohlich, Bogner, & Schultz, 2014). An outdoor wilderness education program that also taught EE improved teens' environmental sensitivity (Metzger & McEwen, 1999). Nature-based summer camps left teens and middle school students feeling more connected to nature, and generated hopes of sharing nature connections with family (Henderson, Garst, Bialeschki, & Santucci, 2010). Summer camps that targeted science knowledge and taught science outdoors, improved student learning and increased enthusiasm for learning science (Bischoff, Castendyk, Gallagher, Schaumloffel, & Labroo, 2008). Therefore, outdoor EE and science programs can help students to connect with nature.

Programs like those described above have been offered for over a decade at Montreat College and have been labeled expeditionary science. Specifically CLIMBE (2008) and MYLES (MYLES of Science, 2015) provided outdoor EE and science programming while immersing

students in wilderness. Metzger and McEwen (1999) studied teens' environmental sensitivity during a program that had similar components to CLIMBE (2008) and MYLES (2015), therefore it could also be labeled as expeditionary science.

These expeditionary science programs are one way to reach teens in their formative years, as teens explore their own connections to science and nature. Few studies have looked at programs for teens that included all the components of expeditionary science. Studies that used programs similar to expeditionary science (like Metzger and McEwen, 1999) did not measure connectedness to nature. Other studies recommend that more research be done to widen the survey age range of connectedness to nature theory (Ernst & Theimer, 2011; Lieflander et al., 2014). Lieflander et al. (2014) suggests that more connectedness to nature studies be done on ages 11 and older. Therefore, studying the impact of the MYLES program on teens' connectedness to nature could lead to a better understanding in this age group. The MYLES study could also reveal program strategies for strengthening connectedness to nature in teens.

Research Questions

Weeklong MYLES' programs immersed teenagers in nature and environmental studies in wilderness settings (MYLES of Science, 2015). Students who participated in MYLES hiked, backpacked, camped and did fieldwork in the Great Smoky Mountains National Park (MYLES of Science, 2015). Collecting data from MYLES' students during the summer of 2016 explored the impacts of the program on teens' connectedness to nature. The primary research question was, "Do teens' connectedness to nature scores change after participating in the MYLES expeditionary science program?" The secondary research question was, "What program elements and experiences during MYLES influenced any change in teens' connectedness to nature?"

Key Terms

Nature. Areas outside that are rich in vegetation and non-human life, including forests, urban parks, rivers and streams, and relatively untouched wilderness regions (Logan & Selhub, 2012).

Nature-deficit disorder. A phenomenon that describes the human costs of "alienation from nature, among them: diminished use of the senses, attention difficulties, and higher rates of physical and emotional illnesses" (Louv, 2005, p. 36).

Connectedness to Nature. Mayer and Frantz (2004) define connectedness to nature as "the extent to which an individual includes nature within his/her cognitive representation of self" (p. 504).

Environmental Education (EE). A type of education with the following goals, "to develop a world population that is aware of, and concerned about, the environment and its associated problems, and which has the knowledge, skills, attitudes, motivations, and commitment to work individually and collectively towards solutions of current problems and the prevention of new ones" (UNESCO-UNEP, 1976, p. 2).

Expeditionary science. A type of programming that teaches science and ecological concepts using EE strategies and hands-on field science in the context of a multi-day wilderness immersion (Shuman, 2011). As a program type, expeditionary science is based on the inquiry-based scientific expeditions of well-known explorers Andre Michaux, Alexander von Humboldt, Louis Agassiz, Asa Gray, and others, who advanced numerous scientific disciplines and expanded our knowledge of Earth's biological systems (Daniel, 2011).

Environmental sensitivity. A personal perspective of the natural environment; how a person feels about the environment and nature (Metzger & McEwen, 1999).

Environmental awareness. An awareness of how humans are inextricably tied to the nonhuman environment (Goleman et al., 2012).

Formative influence. In regard to the environment, formative influence is the foundation of environmental beliefs, developed throughout life but most often in childhood (Chawla, 1999).

CHAPTER 2.

LITERATURE REVIEW

This review of the literature focuses on the psychology of connectedness to nature, and on the formative influences of nature in regard to human and nature connectedness. Other areas reviewed are: environmental sensitivity with pro-environmental behavior; sense of place and humans' connectedness to nature; technology, urbanization, and fear as negative impacts on humans' connectedness to nature; teens and nature experience; and connectedness to nature scales and/or measures.

Psychology and Humans' Nature Connectedness

The branch of psychology known as ecopsychology is concerned with the emotional bonds that exist between humans and nature. These bonds are thought to be innate from the time a person is born (Brown, 1995, p. xvi, as cited in Roszak, Gomes, & Kanner, 1995). This section highlights studies on how people feel about nature after having experienced it.

South African college students, aged 20-23, camped primitively for more than a week and were interviewed by researchers about their nature experience (Greffath, Meyer, Strydom, & Ellis, 2012). They recounted positive personal and transcendental effects by describing their experiences as spiritually uplifting, restorative, timeless, and/or peaceful (Greffath et al., 2012). Davis and Atkins (2009) studied cultural tribal influences on young people through nature experience, and found that connecting with nature went deeper when elders were involved in outdoor programs. Nisbett's (2011) research analyzed personal journals regarding nature relatedness and found that more time in nature correlated with more happiness. Nature in and around the home (and even seen out a window) acted as an anti-depressant in people, according to a study in Germany (Logan & Selhub, 2012). Louv (2005) described how children (of

Norway) who played among rocks, trees, and on natural ground fared better with motor skills and intellectually than children who played on flat, manmade playgrounds. Sobel (2008) stated the importance of children's nature relationships in improving school performance. Smith and Sobel (2010) recommended nature be a part of school curriculum since many studies find nature beneficial to learning. It seems that nature connections could be beneficial to all humans for reasons like enhanced calmness, spirituality, happiness, improved motor skills, and enlightened intelligence (Davis & Atkins, 2009; Logan & Selhub, 2012; Louv, 2005; Hedlund-deWitt, 2013; Sobel, 2008).

Formative Influences on Humans' Nature Connectedness

Aldo Leopold (1949) wrote that humans should treat the land as a fellow being, and he helped to teach the value of the land itself. He wrote, "The land ethic simply enlarges the boundaries of the community to include soils, waters, plants, and animals, or collectively: the land" (Leopold, 1949, p. 204). Leopold lived by this standard and raised his children along the banks of a river, growing food on land that had been brought back to life from intense farming, and immersing his family in nature (Louv, 2011). Research shows that people raised with nature as part of everyday life are more connected to nature (Chawla, 1999; Kals et al., 1999). Being in nature, and having wilderness experiences, are two of the most important influences on nature connectedness. These are reviewed below as part of formative influences.

Being in nature. In studying which life experiences formed human connections to the environment, Chawla (1999) interviewed 56 adults who worked in the field of environmental science. Many (77%), reported that, while growing up, they were mentored by a person who cared about nature and spent numerous hours outside with them (Chawla, 1999). Being in nature (especially between the ages of 7-17) was an important influence for participants as they grew up

and chose environmental careers (Chawla, 1999). Kals et al. (1999) surveyed 281 adults on how they first became interested in nature. There were four significant themes: *past* frequency of time spent in nature, *present* frequency of time spent in nature, *past* significant accompaniment by a family member during nature experiences, and *present* significant accompaniment by a friend/family member/partner during nature experiences (Kals et al., 1999). These influences accounted for almost 40% of how participants (N=281) first became connected to nature (Kals et al., 1999). Both studies show that nature interest traces back to having nature experiences when young, and especially when mentored by significant friends and/or family members.

Beery and Wolf-Watz (2014) also found that youth (from ages 7-18) who spent time in nature while growing up reported feeling more in tune with nature as adults. The researchers examined several aspects of nature connectedness using surveys answered by 1700 Swedish adults (Beery & Wolf-Watz, 2014). Their study found that familiar places were especially meaningful in establishing nature connections (Beery & Wolf-Watz, 2014). Beery and Wolf-Watz (2014) also reported a modest positive relationship between environmental connectedness and a tendency to care for the environment. Henderson et al. (2010) interviewed 11-17 year old campers who said the more time they spent in nature during camp, the more knowledgeable and responsible they felt for the environment.

Wilderness experience. Research shows that being immersed in wilderness creates a close bond with nature, often unparalleled by other experiences (D'Amato & Krasny, 2011; Greffath et al., 2012). Feeling close with nature was a common theme described in student journals after a 3-day high school canoeing wilderness trip (Metzger & McEwen, 1999). Haluza-Delay (2001) interviewed urban teenagers that spent 12 days hiking in the remote Canadian wilderness. The teens referred to their time in nature as a powerful experience that enhanced

concern for the environment (Haluza-Delay, 2001). The Metzger and McEwen (1999) program was described in the literature as adventure EE for teens and could be labeled as expeditionary science.

People who had more wilderness immersion experience showed stronger affective connections to nature and reported more environmentally concerned behavior (Kals et al., 1999). Hanna (1995) found that people felt more strongly about preserving wilderness after being exposed to field ecology programming tied in with adventure-education experience. Hanna (1995) suggested that outdoor adventure programming for children should include introductions to ecological concepts in order to create eco-centric attitudes. All the research reviewed here highlights that people do form connections with nature when wilderness is involved (D'Amato & Krasny, 2011; Greffath et al., 2012; Haluza-Delay, 2001; Kals et al., 1999; Metzger & McEwen, 1999).

Environmental Sensitivity and Pro-environmental Behavior

Wilson (1997) concluded that nature play, as compared to playing on grass lawns and manmade structures, was best for developing a child's environmental sensitivity. Research shows that people often remove wild nature from playgrounds, yards and neighborhoods (Logan & Selhub, 2012; Louv, 2005; Wilson, 1997). Sobel (2008) and Louv (2005) think that the removal of nature from homes and schools negatively impacts peoples' comfort in nature and that if adults are not comfortable in nature, children will not be either. The formative years of childhood are when most connectedness to nature develops (Ernst & Theimer, 2011; Kals et al., 1999; Wilson, 1997). On the contrary, people not sensitive to the natural world are less likely to care for the environment (Geng, Zu, Ye, Zhou, & Zhou, 2015; Goleman et al., 2012). Nurturing

connectedness to nature and environmental sensitivity when people are young help those people to have pro-environmental behavior (Chawla, 1999; Kals et al., 1999).

Metzger and McEwen (1999) found that environmental sensitivity in 12-19 year olds increased as a result of a program with expeditionary science components. Based on their score on the environmental sensitivity index (known as the ES), participants had a statistically significant increase from pre to post program ($p = .0001$). Additionally, open-ended questions asked the students which elements of the program made them feel a connection with nature (Metzger & McEwen, 1999). Going into a cave, seeing the river, and living among nature and animals were the answers given (Metzger & McEwen, 1999). It was concluded that the nature connections were the reasons that ES increased (Metzger & McEwen, 1999).

When connections between humans and nature increase, there seems to be an increase in short-term pro-environmental behavior (Bratman et al., 2012; Geng et al., 2015; Hoot & Friedman, 2011). Ernst and Theimer (2011) found that EE programs aided middle school students in feeling more connected to nature. Time outside and experiences with wildlife seemed to trigger the most connectedness (Ernst & Theimer, 2011). The researchers interviewed some of the same students later (four weeks after the EE programs) and determined that future environmental stewardship was a possibility for those still feeling connected (Ernst & Theimer, 2011). According to Mayer and Frantz (2004) environmental behavior can actually be predicted by how strongly a person feels that they belong to the natural world. This notion led to the development of a research instrument called the Connectedness to Nature Scale (CNS). The CNS measures how connected to the natural environment a person feels (Mayer & Frantz, 2004).

Nisbett (2011) found that no matter how nature connectedness is measured, a reliable relationship exists between it and self-reported pro-environmental behavior. In fact, feeling

more connected to nature led to some pro-environmental actions such as recycling and bringing one's own grocery bags in a study in China (Geng et al., 2015). Beery, Ingemar Jonsson and Elmberg (2015) examined several human and nature connection theories and found that both *topophilia* (a human's innate connections to landscapes developed by Yi-Fu Tuan) and *biophilia* (a human's innate connections to all non-human life developed by E.O. Wilson) play a part in promoting sustainable environmental efforts. These researchers (Beery et al., 2015) suggest that *topophilia* and *biophilia* be used as program methodology for triggering human environmental actions. Beery et al. (2015) think that peoples' nature experience may go extinct if educators do not continually build on humans' nature connections.

Teens and Nature Experience

After four weeks, Lieflander et al. (2014) found a continued improvement in younger children's (ages 9-10) connectedness to nature as measured by the Inclusion of Nature in Self (INS). The older children's INS (ages 11-13) increased immediately post program, but the increase did not last when the posttest was taken again four weeks later (Lieflander et al., 2014). Based on other nature connectedness studies, educators can build on nature relationships through the help of science programming, camps, and wilderness excursions (Bischoff et al., 2008; Greffath et al., 2012; Henderson et al., 2010). Connectedness to nature is often enhanced in children immediately after an EE program (Ernst & Theimer, 2011; Lieflander et al., 2014).

Henderson et al. (2010) studied how nature-based camp experiences can make a difference in youth's (middle school and high school aged) love of the out-of-doors. In camper journal entries, students wrote about making real connections with the environment, especially when feeling nature, smelling the scents, seeing wildlife, and when immersed in nature (Henderson et al., 2010). Campers longed for nature experiences back home and made

statements on how at home there was too much television, or not enough time outdoors (Henderson et al., 2010). Bischoff et al. (2008) found that a university science camp enriched knowledge and awareness of the environment. They concluded that high school students need challenges in collaborative thinking and hands-on applications of scientific principles in order to become scientists (Bischoff et al., 2008). Henderson et al. (2010) and Haluza-Delay (2001) concluded that young people were open to nature experience, yet sometimes did not know how to find it. Metzger and McEwen (1999) found that through an immersion EE adventure expedition for teens (identical to an expeditionary science trip as defined before), students made connections with nature and increased their environmental sensitivity. Additionally, landscapes and places can impact sensitivity and connectedness to nature (Beery et al., 2015).

Sense of Place and Human Nature Connectedness

Sense of place involves "building upon attachments to geographical localities, which contributes to the formation of personal and social identity" (Feld & Basso, eds. 1996, p. 53). People bond with places and learn to make meaning of their own place in the world by having local environmental experiences (Avery, 2013; Goleman et al., 2012). Having a sense of place also enhances a person's environmental sensitivity, and could expand a person's worldview to include nature (Hedlund-deWitt, 2013; Sampson, 2014).

Beery et al. (2015) wrote that when examining what nature means, its definition should involve people and their places. In other words, since humans appear so disconnected from nature (due to urban living, less work in the outdoors, technology, etc.) studies should try and find out which nature experiences are important to humans in feeling connected to the land (Beery et al., 2015). Beery et al. (2015) call this type of study an examination of "environmental

connectedness" which looks at the affective, cognitive, and/or physical human relationship with nature, including land and all nonhuman living beings.

Sampson (2014) suggested that to achieve environmental sustainability, humans must develop relations with living and nonliving things in the natural environment. Kudryavtsev, Krasny, and Stedman (2012) conducted research to find out if urban high school students would feel more ecologically connected to their home place after learning in natural places near them (like urban waterways and gardens of the Bronx). The study found that developing a student's sense of place slightly enhanced environmental stewardship intentions (Kudryavtsev et al., 2012). Avery (2013) also highlighted the importance of local ecological knowledge in developing rural students' awareness of the environment around them. Avery (2013) reported that rural children are often exposed to local agricultural science more than local environmental science. Therefore, environmental education place-based efforts, in both urban and rural areas, could help address disconnect from nature in humans (Goleman et al., 2012).

Technology, Fear of Nature, Urbanization, and Disconnect from Nature

There are stressors on the human and nature relationship that include humans' increased reliance on technology (Fox & Edwards, 2015; Gomes, 2012), a growing fear of nature (Fägerstam, 2012), and the lack of access to nature (Beery et al., 2015; Haluza-Delay, 2001). Louv (2011) concluded (from reviews of recent research) that people spend much less time outside than ever before. One reason why is that people are heavily tuned in to technology (Louv, 2011). Recent research on technology revealed that high school students spent nine hours a day using screens like computers, phones, tablets, and television (Fox & Edwards, 2015). Some research says that it takes removing technology from young people's lives (temporarily) for them to even notice their screen addictions (Gomes, 2012; Hall, 2013). One college

professor found that her students (18-22 years old) rediscovered meaningful connections with nature, friends, and family after a weeklong technology hiatus (Gomes, 2012).

Certain studies find fear to be a cause of the human and nature disconnect (Fägerstam, 2012). People who are not used to being in nature can feel fearful and uncomfortable in it (Fägerstam, 2012; Louv, 2005). Fägerstam (2012) described teachers' fears of taking kids outside "in the bush" of Australia because of dangerous wildlife and chances of injury. Johnson-Pynn et al. (2014) described students who feared wildlife in rural Uganda, until environmental educators took them on guided educational walks through a wildlife park. Both studies concluded that EE programs eased human fears through human/nature relationship building.

Urban teens in the Haluza-Delay wilderness study (2001) reported that while in the wilderness they felt connected to nature, but at home those connections were difficult to find. Feeling disconnected seemed to tie in with a lack of pro-environmental behavior, as Haluza-Delay (2001) reported that the teens in his study were unsure of any actions they would take at home to protect the environment. They reported feeling too far removed from nature and some said that nature at home was already ruined and beyond help, so they wouldn't care for it (Haluza-Delay, 2001).

Instruments which Measure Connectedness to Nature

The Connectedness to Nature Scale (CNS) created by Mayer and Frantz (2004), measures how connected to nature a person feels. It is used worldwide to measure connectedness to nature, and a high CNS score often correlates with pro-environmental behavior (Mayer & Frantz, 2004). The CNS design upholds Leopold's (1949) assertion that people must feel part of the natural world in order to value it, to protect it, and in order to treat it sustainably. Johnson-Pynn et al. (2014) measured Ugandan youths' connectedness to nature by using the CNS. Educators in

Uganda worked carefully to build new relationships between the students and the wild animals in a park nearby, so that the villagers' fear of the wild would lessen (Johnson-Pynn et al., 2014). Rural Ugandan youths' CNS scores improved after the environmental programming, as did other measures like efficacy and inclusion of nature in expressions of self (Johnson-Pynn et al., 2014).

The INS created by Schultz (2001) can also measure connectedness to nature. Lieflander et al. (2014) surveyed elementary students in Germany using the INS. Students (ages 9-10 and 11-13) were given the INS to complete, before and after 4 days of outdoor immersion EE programming (Lieflander et al., 2014). The scores significantly increased for both age groups after the outdoor EE programs. Notably, the younger age group (9-10) had higher INS scores than the older age group (11-13) throughout the study (Lieflander et al., 2014). The younger students maintained an increase in INS scores when surveyed again four weeks later, but the older group did not retain their increase (Lieflander et al., 2014). Lieflander et al. (2014) suggested that more connectedness to nature research be done in children, especially in ages 11 and up.

This literature review examined what connectedness to nature is, and what studies on connectedness to nature and expeditionary science exist. Children and teens can become more connected to nature, at least in the short term, after EE and/or outdoor adventure programming (Ernst & Theimer, 2011; Geng, et al., 2015; Hoot & Friedman, 2011; Lieflander et al., 2014; Metzger & McEwen, 1999). Environmental sensitivity appears to be an important factor in enhancing connectedness to nature (Metzger & McEwen, 1999). Several instruments measure a person's connectedness to nature, the CNS and the INS (Mayer & Frantz, 2004; Schultz, 2001). Although programming does seem to impact a person's connectedness to nature, being connected may come more from formative experiences during childhood (Kals, et al., 1999).

Expeditionary science seems to be one way to reach teens in their formative years, as they explore their own connections to science and nature (Metzger & McEwen, 1999). Studies recommend that more research be done to widen the survey age range of nature connectedness theory (Ernst et al., 2011; Lieflander et al., 2014). Lieflander et al. (2014) suggests that more studies be done on students 11 years old and up. Studying students' connectedness to nature before and after the MYLES 2016 summer program aimed to do so.

CHAPTER 3.

METHODOLOGY

The primary purpose of this study was to find out whether the expeditionary science program, MYLES of Science (MYLES), changed participant's connectedness to nature (via pre- and post- survey scores). A secondary purpose was to explore what caused students to feel more or less connected to nature by asking three open-ended questions. Due to the exploratory nature of the research, a mixed-methods approach (Creswell, 2014) was used. There was no control group for comparison in this study. Participants were a convenience sample (Creswell, 2014) from one summer of the MYLES program, who signed up willingly to take part in the research.

Program

MYLES is a grant funded expeditionary science program based out of Montreat College, North Carolina. Environmental educators, scientists, and interpretive rangers worked together to serve students in the program. During the summer of 2016, MYLES took place mainly in the Great Smoky Mountains National Park (GSMNP). Participants were primarily from North Carolina. Students were recruited by word of mouth and by presentations given to science teachers in Western North Carolina. Montreat College displayed the MYLES program on its website. The program was also advertised a few times on the Environmental Educators of North Carolina teacher and educator listserv.

Because of grant funding, MYLES was offered at a low cost, with partial and full scholarships available for students from all socio-economic backgrounds. MYLES students resided mostly in North Carolina. Demographic and career interest surveys, filled out by the students prior to the study, determined why students applied for this program. Students were accepted regardless of their interest in science and/or in outdoor adventure.

During MYLES, students were immersed in the GSMNP. They did not have access to personal technology such as cell phones for the entire week of the program. Computers were occasionally used in the park to record biological data, and school computers were used at Montreat College to create science presentations (at the end of the week only). The first days of each week were spent at the Appalachian Highlands Science and Learning Center (AHSLC) training the students in field science protocols. There the students had access to a classroom, tent camping platforms, bathrooms, and lab equipment. After training at the AHSLC, the students went into the wilderness to backpack, camp, and do field science.

MYLES' activities included research in biological studies and data collection in physical science. Weather, rain, and soil characteristics all played a part in the research. Staff that worked with MYLES' students included park rangers, high school interns, AmeriCorps interns, and instructors, college-aged students with experience in outdoor education. Instructors led the students in outdoor education, environmental education, backpacking, camping, and science. Various GSMNP researchers, visiting university professors, and visiting graduate students sometimes assisted in educating MYLES participants.

Participants

MYLES was a grant-funded program from 2014-2016 by the Burroughs Wellcome Fund (BWF). Students in MYLES ranged in age from 13-17 years old. MYLES served approximately 16 students each week, divided into two groups with two instructors per group of eight. Approximately 200 students participated in all three years of MYLES (N=200). However, students participating in 2014 and 2015 were not surveyed for connectedness to nature. Fifty-seven students were surveyed who participated in MYLES during the summer of 2016 (n=57).

Research Design

A one-group pretest-posttest survey (Creswell, 2014) was used to explore quantitative changes in connectedness to nature. The Connectedness to Nature Scale (CNS) was used to gather pre- and post- information. Paired t-tests and one-way ANOVAs determined statistical values with a 95% confidence interval.

Three open-ended questions (added only to the posttest) were asked to gather qualitative data. The question format allowed space for participants to discuss what connectedness to nature meant to them and what changes (or no changes) in connectedness to nature might have occurred for them, and why.

Research Instruments

The Connectedness to Nature Scale (CNS). The CNS was used because Mayer and Frantz (2004) determined that the CNS predicted human eco-friendly behavior and provided empirical evidence of Leopold's (1949) notion that connectedness to nature leads to better environmental behavior. Also, the CNS was used because it is a reliable scale that measures affective connections by reflecting humans' environmental sensitivity (Ernst & Theimer, 2011; Johnson-Pynn et al., 2014). The CNS can detect changes in a person's feelings in regard to their relationship with nature (Johnson-Pynn et al., 2014). Frantz and Mayer (2013) described the CNS as an instrument "intended to measure peoples' (or a persons') sense that they are egalitarian members of the natural world" (p. 86).

Statistically, studies show that the CNS does measure a person's connectedness to nature and has good reliability scores in testing. Mayer, Frantz, Bruehlman-Senecal and Dolliver (2009) found that the CNS scale possessed high internal consistency (α =. 84) and good test-retest reliability (r = .79). The CNS consists of 14 questions, with a 1-5 Likert type scale for

answer choice (see Appendix A). Sample statements from the CNS are as follows, 1) I often feel a sense of oneness with the natural world around me, 2) I recognize and appreciate the intelligence of other living organisms, and 3) I often feel a kinship with animals and plants. Responses to the CNS are given on a five-point scale of 1=strongly disagree to 5=strongly agree (see Appendix A for the 14-question CNS survey in its entirety). This 14-question scale is intended for teens and adults (Mayer & Frantz, 2004). There is a 10-question CNS survey used with kids younger than age 13 (Lieflander et al., 2014).

Open-ended questions. To glean more information from MYLES students' CNS surveys, three open-ended questions were added to the post-survey. These questions were chosen to help determine what connectedness to nature meant to the student, and which parts of the MYLES experience, if any, contributed to a change in connectedness to nature. The open-ended questions were as follows:

1) What does connectedness to nature mean to you? Please explain.

2) Did anything during your MYLES experience cause you feel **more** connected to nature? Please explain.

3) Did anything during your MYLES experience cause you feel **less** connected to nature? Please explain.

Demographic questionnaire. Demographic data on MYLES participants were collected by questionnaire, at the end of each MYLES program (see Appendix C). Permission from BWF was obtained, via email, to use the demographic data when needed for this MYLES research study.

The BWF SSEP student feedback survey (see Appendix C) was intended to gather demographic information on MYLES students such as gender, ethnicity, grade level, and county

of residence in North Carolina and students' interest in science before and after MYLES. The questionnaires were completed anonymously. However, with permission, the surveys were specially coded in 2016 (by MYLES staff) with a number to match each student's (pre/post) CNS and open-ended questions.

The demographic data were useful in the study, as subgroups were looked at when sorting the responses (such as new participants vs. returning). The CNS changes measured within subgroups (like male vs. female) could be pertinent to EE programmers and to other researchers in the future.

Data Collection

The Institutional Review Board (IRB) of Montreat College approved this study in April 2016. Students in the 2016 MYLES summer program gained permission from parents/guardians to take part in the research. The researcher provided a consent form (see Appendix B) at weekly MYLES registrations/check-in and supervised while forms were signed. Signed forms with a YES served as permission granted for students to take part in the research. Signed forms with a NO, or forms not signed for some reason, served as no consent. Therefore three students did not take the CNS survey, nor did these three students answer the open-ended questions. Those not participating in the CNS research were asked to write in their journals during the designated research times. BWF questionnaires and CNS surveys were coded with a number and a letter, so that they would match. This coding system ensured that the pre- and post- CNS surveys and BWF questionnaire could be matched with the students remaining anonymous. The researcher distributed the pre- CNS surveys to students of MYLES after parent/guardian consent forms were signed at the program's start. The post CNS and open-ended questions were printed on waterproof Rite-in-the-Rain paper and given in the field or in the library at the program's end.

MYLES instructors were trained on the process of handing out the post CNS and open-ended questions and given a script to read. The instructions were, "Please fill out these questionnaires, and take all of the time you need. There are no right or wrong answers." MYLES' instructors were told not to discuss the CNS research among themselves or with teen participants. The effort in training field staff was intended to reduce inconsistencies and mistakes.

Quantitative Data Analysis

All CNS surveys were scored using an online scoring tool from the website: http://www.psytoolkit.org/survey-library/connectedness-nature.html#_legal_stuff. This scoring tool was easy to use and generated pre- and post- CNS scores efficiently. The researcher found this scoring tool while conducting connectedness to nature research, and tested it several times in comparison to CNS scores generated by the researcher's own math (using averages). In all of the comparison trials of the online tool vs. the human math, the CNS scores matched. Therefore, the tool was chosen as a sufficient CNS score calculator.

The scores ranged from 1-5, with the score of 5 being most connected, the score of 3 being neutral, and the score of 1 being least connected, with decimal ranges in between the whole numbers (Mayer & Frantz, 2004). The researcher relied on a concept called "missingness" when it was discovered that the first 35 CNS surveys (pre- and post-) had a clerical error and were missing one question, #9 (see question #9 from the CNS survey, Appendix A). To find a value for this question, the researcher was instructed by the graduate committee statistician to find the mean value of the missing question- using all answers to that question from fully completed surveys. Therefore, a mean value was determined (using the 22 surveys that were correct) and this value served as the answer for question #9 on the 35 surveys that had the clerical error. In this way, a CNS score was tallied for all surveys using the online

scoring tool. Quantitative analysis determined statistical change, if any, from pre- to post- tests. This was done using paired t-tests and one-way ANOVAS.

Qualitative Data Analysis

The researcher analyzed the answers to the 3 open-ended questions created for this study. First, answers were read and coded by the researcher who acted as the primary coder. The text was read for big ideas and a code list was developed (Creswell, 2014). The data was read again and coded into discrete code units (Creswell, 2014). Then, two independent intercoders used established codes to categorize the data. Intercoding ensued until an 80% (or better) agreement rate was established by negotiating codes with intercoders (see Table 6).

In more detail, the researcher coded answers to the three questions, then sent codes and definitions to the first intercoder (C1). C1 read all participant answers and coded them using the primary researcher's codes. Any new codes determined by C1 were added to the list. C1 then sent back a completed coding spreadsheet (with existing codes, and any new codes) to the researcher. There were several back and forth correspondence emails/phone calls.

C1 intercoded all data (100% of answers to open-ended questions). Using a calculator, the primary coder determined an agreement rate by comparing how many of the questions were coded the same by C1, to how many of the questions were coded differently by C1. An agreement rate of 80% or higher was needed to establish trustworthiness in data coding (Creswell, 2014). Discussions by email and/or phone call were held among the primary coder and C1 to review and refine the codes. It took four discussions to reach $\geq$80% agreement for questions 1 and 2. Question 3 had a >80% agreement rate immediately, so no discussion was necessary.

A second intercoder (C2) analyzed only 20% of the data (generated through a random

number generator). C2 had ≥80% agreement rates to all questions the first time around (see table 6). Therefore, no discussion was necessary. Results of the qualitative questions responses were summarized with themes as well as representative quotes (Creswell, 2014). All themes were reported.

CHAPTER 4.

RESULTS

Quantitative results of this study showed that MYLES participants' CNS scores showed a statistically significant increase. Results from the open-ended questions also showed that most MYLES students felt that being connected to nature meant to be one with it. Furthermore, MYLES students felt increased connectedness to nature because of being immersed in it. Finally, most participants said that nothing about the MYLES program made them feel less connected to nature.

The quantitative results will be discussed first and are displayed via tables and figures. Statistics were run using SPSS 22 computer software with Dr. Brad Faircloth, a Montreat College graduate advisor. For the qualitative data, the results are displayed using bar graphs.

Quantitative Results

Data for this study was taken from 57 MYLES participants (n=57). There were 24 females, 31 males, and 2 of unlisted gender. Fifty students answered "Caucasian" as their ethnic group, and 7 listed "Mixed race" or "Other" as their ethnic group. There were 17 rising ninth graders, 19 rising tenth graders, 13 rising eleventh graders, and 8 rising twelfth graders (see Table 1).

Table 1

Student Demographics of 2016 MYLES Research Participants

Male	**Female**	**N/A**	**Caucasian**	**Other race**	**9th**	**10th**	**11th**	**12th grade level**
31	24	2	50	7	17	19	13	8

Note. n=57

Fifty-seven students took the pre- and post- CNS test during MYLES. The CNS pre-program mean score was 3.5669 and the post-program mean score was 3.6797. The t-test results

show that the CNS of participants increased; t= .1128, p= .02 (see Table 2). Therefore, the differences between pre- and post- CNS scores reveal a significant increase.

Table 2

T-test results from Pre to Post CNS scores (taking into account missing question #9)

Measure	**Variable**	**Mean**	**Std. Dev.**	**n**
CNS Pre- Score	No missing	3.6169	.38908	22
	Missing #9	3.5355	.39632	35
TOTAL		**3.5669**	**.39209**	**57**
CNS Post- Score	No missing	3.7240	.45938	22
	Missing #9	3.6518	.41306	35
TOTAL		**3.6797**	**.42893**	**57**

Note. n=57 CNS scores; t = 0.1128; p= 0.021 (95% confidence interval)

Found above (see Table 2) are two sub-populations (n=35, n=22). These numbers reflect the researcher's discovery that the first 35 CNS surveys given (pre- and post-) were missing one question. More specifically, question # 9 (see Appendix A) was missing from 35 surveys and was not missing from 22 surveys. After consulting with the graduate committee, a value was calculated quantitatively for the missing question. The researcher calculated the average of all #9 answers that existed (n=22). Since all CNS answers had individual numbers between 1-5 (see Appendix A for the questionnaire) it was possible to calculate an average. Therefore, a CNS score was calculated for every pre- and post- CNS that needed it (n=35). Both the t-test (see Table 2) and ANOVA test (see Table 3) results indicate no differences between these groups; t= .1128, p= .021; F= .579, p= .450. In other words, the group missing item #9 was no different than the group receiving all questions. All analyses include the full sample of n=57.

Table 3

One-way ANOVA: Tests of Between-Subjects Effects (95% Confidence Interval)

Between-Subjects Factors	**#**	**F-value**	**Sig(p)**
CNS missing #9	35		
CNS no missing	22		
Statistics		.579	.450

Note. n=57

Other potential moderating factors on CNS questionnaires, such as whether the MYLES students were returning or new to the program, or the location of where the post survey was given, were found to be insignificant. Each year, some students return to MYLES to experience it again. Therefore, each week had a mixture of students new and returning. There were quite a few returning students in the 2016 summer MYLES program. However, the presence of new (n=36) and returning students (n=21) was found to have no significance on CNS scores; F= 2.074, p= .156 (see Table 4).

The original research design protocol recommended that the post CNS be taken outside, while students were still in nature on the last day of MYLES. However, some instructors forgot to give this post survey in nature, and instead they gave it to students when back on campus in the Montreat College library. It appears that location had no significant effect on CNS scores; F= .95, p= .33 (see Table 4).

Table 4

One-way ANOVA Results: Students New to MYLES, or Students Returning to MYLES & Post CNS Questionnaire Taken in Library or Taken in Nature

Between-Subjects Factors	**# of Students**	**F-value**	**Sig (p)**
New MYLES students	36		
Returning MYLES students	21		
Statistics		2.074	0.156
CNS taken in Library	9		
CNS taken in nature	48		
Statistics		0.950	0.334

Note. n=57; based on a 95% confidence interval

Participant CNS scores are graded in a range from 1-5. None of the scores were below 2. In total, 32 CNS scores increased, 8 CNS scores stayed the same, and 17 CNS scores decreased (see Figure 1). In females, 18 scores increased, 2 stayed the same, and 4 decreased. In males, 14 scores increased, 5 stayed the same, and 12 decreased. The highest score combination (pre/post) on the CNS was exhibited by student E14 (a new female student of MYLES) with scores of pre/post =4.14/4.43 and the lowest score combination (pre/post) was from student C5R with pre/post = 2.79/2.93 (a returning male student of MYLES). Student D2RL (a returning female student of MYLES) had the most notable increase from pre- to posttest (with a 0.93 increase) and five students showed the smallest increase of 0.07 (students B3R, B6, D10, E10, and E12R), 2 of these being returning students, 1 being male, 1 unknown, and 3 are females. See Figure 1 for all individual pre/post CNS results.

Figure 1: Connectedness to Nature Scores

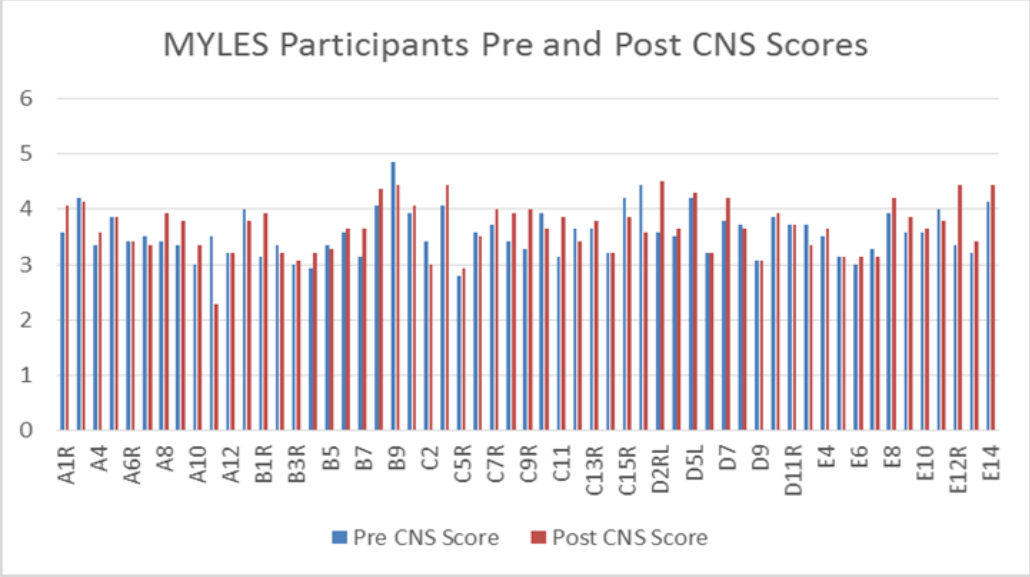

Figure 1. n=57, Pre- and Post- CNS scores (in a range of 1-5, and 5 being greatly connected)

Qualitative Results

Qualitative data came from 3 open-ended questions, given to participants at the same time as the post CNS surveys. A total of 54 MYLES participants answered the three open-ended questions (n=54). Answers were coded by the researcher as primary coder, and by two inter-coders; one who coded 100% of the data (C1), and another who coded 20% of the data (C2). The goal, to establish trustworthiness in the coding process, was to reach ≥80% agreement between the primary coder and the intercoders (Creswell, 2014). See Table 5.

Table 5

Qualitative Analysis: Coder and Intercoder Agreement Rates of 3 Questions

Coder/Question	1st Agreement %	2nd Agreement %	3rd Agreement %
C1/Q1	52	73	88*
C1/Q2	56	67	98*
C1/Q3	90*		
C2/Q1	82*		
C2/Q2	91*		
C2/Q3	100*		

Note. Coder/intercoder agreement rate ≥ 80% and *indicates meeting this rate; C1 intercoded 100% of the data; C2 intercoded 20% of the data (n=54)

The three open-ended qualitative questions, with results, are listed below with ensuing themes/subthemes. Not all students answered the questions. Therefore, the open-ended question data set is n=54. Most answers did include multiple themes, so bar graph totals do not equal 54, nor do the percentages equal 100. Representative quotes are often used to illustrate themes. The spelling or grammar errors within student quotes are the mistakes of the student. In this section, student quotes will be accompanied by a two-letter code so that the reader can determine if a student is male (M) or (F) or unknown (U), and if a student is a returning participant to MYLES (R) or a new student to MYLES (N). For example, if a female student new to MYLES made a

comment on how being outside for multiple days helped her to feel more connected to nature, her code would be (FN). Tables and/or figures are also used to highlight themes when necessary.

Question 1: What does connectedness to nature mean to you? Please explain.

This open-ended question was asked so that the participants could describe what connectedness to nature meant to them. There were five themes that emerged from the responses (See Figure 2). These themes were: 1) Feeling one with nature (55%), 2) Reliance and responsibility towards nature (37%), 3) Embracing nature (29%), 4) Knowledge of nature (22%), and, 5) Awareness and respect of nature (20%).

Figure 2. Student Responses to Question 1

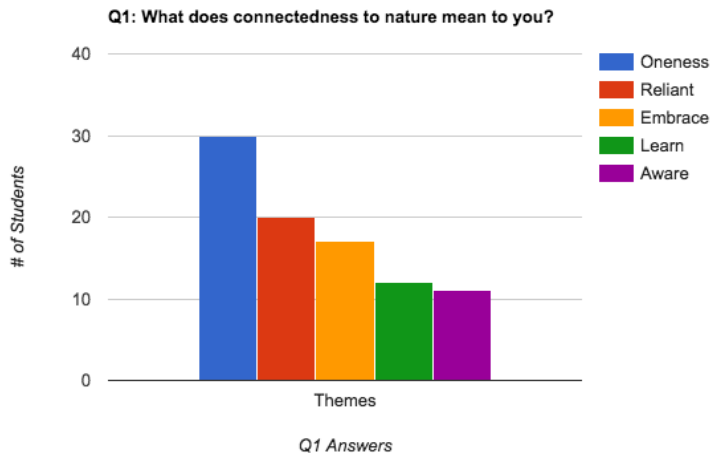

Figure 2. Emergent themes from MYLES qualitative data (n=54)

Feeling one with nature. This theme was expressed by 30 (55%) of respondents. Some said they embraced life through nature, some felt part of a greater life force, and some felt they and nature were one. One student wrote that connectedness to nature meant "feeling a oneness with the nature around you. Or even just feeling like nature takes care of you as you take care of

it" (FR). Another student expressed "being connected with all the living creatures and plants and the forest. Being a part of nature and understanding what it means to be a person on earth" (FR). As can be seen with the next quote, being connected with nature was sometimes expressed as awe-inspiring: "Nature is magical and beautiful and connecting with it means experiencing and becoming one with it" (MN).

Feeling reliant on and responsible for nature. This theme encompasses subthemes like relying on nature's resources for survival, having an awareness of human impacts on nature, and having a sense of responsibility towards nature. Twenty (37%) answers were coded into this category. One student wrote, "We live our lives based around nature. The food that we eat and the water that we drink and the places that we live come from nature" (FR). The quote exemplified a feeling of connectedness to nature through the food web. Indicating a sense of human responsibility for nature, one student wrote, "It means that someone realizes that they are not the only species that exists and that nature is also important/needs to be looked after and enjoyed" (FR). Again, referring to responsibility for nature, a student wrote, "connectedness to nature means to me that I am aware of how nature is impacted by both me and to the human race as a whole. I feel as though my connection to nature is established by what I do to change it, as well as by what I don't do" (MR).

Embracing nature. Having a heart filled with emotion and feeling something like love, fondness, or appreciation towards nature was what being connected to nature meant for some students. There were 17 respondents (29% of total) who expressed caring about, empathizing with, and liking or loving nature. To one student "connectedness to nature means understanding, appreciating, and loving nature" (FR). To another, "connectedness to nature means feeling peaceful and happy when you are outdoors in the natural world. I think feeling connected to

nature means you feel like being in nature takes away everyday stress and you become focused on the beautiful world around you" (FN). And finally, "it means having a sense of being at home when in nature and not only respecting it but loving it" (MR).

Knowing things about nature. There were 12 responses (22%) stating that knowledge and understanding nature were part of the meaning of connectedness to nature. Different from having a heart that was engaged and feelings of love toward nature (like the above theme), these students expressed that an active mind and knowledge were important. One student wrote, "It means you're really smart about nature. You know a lot about it and you appreciate it" (FN). Another student expressed his definition as "an understanding of how things live and die" (MR). One teen described knowing as "to know what nature means and how it affects us and how we affect it" (MN). Sometimes MYLES instructors were mentioned as imparting this knowledge, and other times the students found the knowledge just from being out there in the wilderness.

Awareness and respect for nature. This theme (from 11 respondents, 20% of answers) reflected student's expressions of appreciation, awareness, and respect of nature. One student defined connectedness to nature as, "it means that you are appreciating it and you are respecting it" (FN). Another participant said, "to me, connectedness to nature means being in nature, hearing the birds, seeing the flowers and smelling the mountain air" (MR). This student was aware of nature's elements through his own sensory stimulation. Being connected to nature was also "making an effort to preserve & protect habitats and wildlife. Respect nature. Leave no trace. Enjoy nature for what it is and don't try to change it" (FN). The students learned about Leave No Trace (LNT) principles as part of the MYLES program. LNT teaches people to leave minimal impact behind in each place visited.

Question 2: Did anything during your MYLES experience cause you feel **more** connected to

nature? Please explain.

Upon analysis of this question, five themes emerged (n=54): 1) Immersion in nature (70%), 2) Wildlife encounters (43%), 3) Gaining knowledge (22%), 4) Pure enjoyment (18%), and 5) No, nothing (.05%). Subthemes are referred to under each theme (see Figure 3).

Figure 3. Student Responses to Question 2

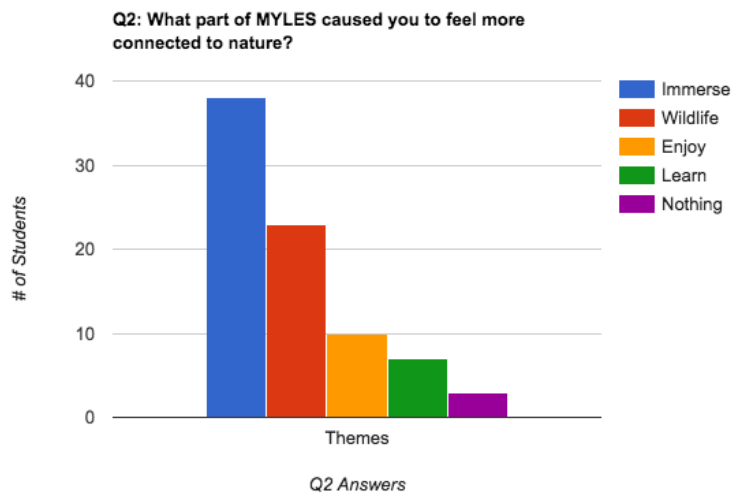

Figure 3. Emergent themes from MYLES qualitative data (n=54)

Immersion. Thirty-eight students, or 70% of the 54 total, indicated that the immersion in nature/the elements caused them to feel more connected. This theme included responses (subthemes) on hiking, backpacking, camping, using the bathroom, and sleeping outside. Some student answers were, "Yes, because the backpacking and hiking made me separate from society and see the 'nature world' at another spectrum" (FN) and "Most definitely! Spending a week sleeping in the woods and listening to all of the animals/insects around me really made me feel like I am more of a part of the natural world around me" (FR). Some of the responses fell into several themes, like this one regarding immersion, and feeling part of nature's cycles, "Yes, because we slept outside, went to the bathroom too. Also, because I learned we do processes just

like nature" (FN). Although appreciation of wildlife, knowledge gained, and being a part of the elements were all referred to in these answers, immersion turned out to be the largest theme as it captured the essence of expeditionary science - to be part of nature while studying it.

Wildlife encounters. Twenty-three (or 43%) of the students who answered this question had influential wildlife encounters to report. These interactions took place randomly or while the students were taking data on something. Subthemes were seeing wildlife, hearing wildlife, encountering wildlife, and handling wildlife for scientific study.

On seeing wildlife, one student proclaimed, "I saw an adolescent black bear and it was minding its own business. It was incredible" (FN). At least 12 students discussed seeing, hearing and sensing wildlife as part of their connectedness. In regard to data collection on snails and salamanders, students wrote things like: "finding the salamanders was an incredible experience finding where they live" (MN) and "being around salamanders and snails. I realized there were tiny life forms all around me and I need to be careful not to step on them" (MN). One student exclaimed in his writing, "I have a strong feeling of being connected on my own, but during the trip I got out of my tent one night and ended up about 7 feet away from a doe" (MR).

Pure enjoyment. Some students reported appreciating nature as a gift and some also just embraced the sunrises and the scenery and the peacefulness of the surroundings. There were 10 answers (18%) expressing connectedness to nature in this way. Subthemes hinted at sense of place. The subthemes were: enjoying opportunities for quiet and tranquility, having magic and/or memorable moments, and discovering and/or enjoying the beauty of nature while immersed. From one student, "when I was just laying down and hanging out quietly at the creek, I felt very related (more than I have been in a long time) and connected to the world around me" (FR). This student found a sense of place while in the stream. Another wrote, " I really enjoyed

camping in the backcountry b/c I could hear the sound that nature makes and not hear any cars or things like that" (FN). An exuberant response from a returning MYLES student was, "yes! Just as in previous years, I enjoy waking up before everyone else to go watch the sunrises at Purchase Knob and that silence and tranquility brings me closer to nature" (MR).

Gaining knowledge. Seven (13%) of the responses indicated knowledge was a factor in being more connected to nature. As a science program, MYLES included environmental education elements in learning about air quality, soil science, and animals like snails and salamanders. One student wrote, "I know more and can appreciate more" (FN) in her response to this question. Another student wrote more descriptively that, "Learning about all of the different types of snails and salamanders helped me realize how many different types of organisms there are in nature" (FR). Instructors aided in understanding, like noted in this response, "my counselors. They showed us that nature is more complex than we think."

No, nothing. Nothing about MYLES caused more connectedness to nature for three participants (or .05%). One student stated that he liked nature, and he learned how he affected nature during MYLES, but still felt like a separate being from it. Another student simply wrote, "No because I am always in nature." Both students were males, new to the program (MN) and both of their CNS scores decreased. An anomaly did exist within question two. There were eight students who had a decrease in CNS scores, yet they expressed feeling more connected in the open-ended questions. Six of these were males, and two were females. All eight were new to the program.

Question 3. Did anything during your MYLES experience cause you feel **less** connected to nature? Please explain.

There were four themes that emerged from participant answers (n=54). See Figure 4 for

these results. The big themes were 1) Nothing (74%), 2) Discomfort (13%), 3) The (field/science) work (9%), and 4) Returning to society (.05%). Subthemes (if any) are covered under each theme.

Figure 4. Student Responses to Question 3

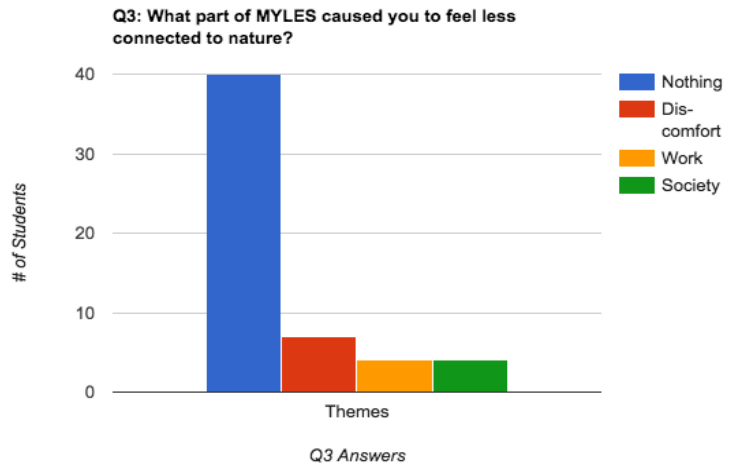

Figure 4. Emergent themes from MYLES qualitative data (n=54)

Nothing. Most responses to this question were No/Nothing. Forty (74%) of students who answered this question said that no part of their experience caused them to feel less connected to nature. In one student's words, "No, the entire week did nothing but make me feel more and more connected with nature" (FR). More descriptively a student wrote, "No, but it made me want to leave the big corporate buildings, cars, phones, and other things. I am definitely more confident with the elements" (UN). Some students just simply said no, and many stated that being immersed in nature for a week made them feel only more connected.

Discomfort. The MYLES experience required teens to leave their creature comforts behind and immerse themselves in the elements. Annoying bugs (two responses) and no

showers or bathrooms (two responses) were the most common discomforts cited. After that, each of these received one answer: being sore, the heavy backpacks, and some restless nights. Altogether, seven students or 13%, pointed to discomfort as causing them to feel less connected to nature. One student who wrote "I HATE pooping and being really smelly" (MN) felt very strongly about the lack of showers and a bathroom. Another student felt that the bugs caused some problems and wrote, "Yes. All the annoying insects biting me made me feel less connected but that was about it" (FN).

The fieldwork. MYLES was not only a backpacking immersion experience it was a science program. The teens learned to do field research and discovered biology and ecology through hands-on data gathering with professionals. Five of the students (9%) felt that the fieldwork they had to do caused them to feel less connected to nature. On the one hand, some did not like disturbing and/or handling animals in the name of science. One student said "Putting salamanders in plastic bags" (MN) was what caused him to feel less connected to nature. The wildlife observations made another student feel "powerless" as she came "face to face with an elk" causing fear and disconnect from nature (FN). On the other hand, a student felt that "doing research in the woods and hearing and watching nature made me see new things, but the tools made me feel as if we were just there to work and not actually explore" (FN).

Returning to Society. One student expressed that an imminent return to society caused him/her to feel less connected to nature. He/she wrote that MYLES enhanced a feeling of wanting to leave "corporate buildings, cars, phones, and other things behind" (UN). Two other students wrote about their eventual return home after MYLES, and expressed that made them feel less connected to nature. Their statements, "My focus on getting back to houses and electricity kept me from focusing on nature as well as I could have" (MN) and "Maybe the fact

that we are always in our houses and not appreciating nature" (FN) made me feel less connected to nature.

The results of this study indicate that students of the MYLES 2016 program had an increase in CNS scores that was statistically significant. Results also show that most had an increase in connectedness to nature after participating in MYLES. Answers to the open-ended questions revealed that a majority of MYLES students described connectedness to nature as feeling one with nature, listed the nature immersion as a the most common cause of being more connected to nature, and listed nothing as the most common answer in what caused them to feel less connected to nature.

CHAPTER 5.

DISCUSSION AND RECOMMENDATIONS

MYLES immersed participants in wilderness, taught ecological concepts using EE strategies, and engaged students in doing field science. These are all criteria for expeditionary science. CNS scores increased overall, based on pre- and post- data collected from the students of MYLES. Fifty-six percent of individual CNS scores also showed increases.

Participants described "nature immersion" and "wildlife encounters" as the two most common themes that connected them to nature. Not all of the students felt more connected to nature, but 56% of them did. "Nothing" was cited the majority of the time in answering what caused the students to feel less connected to nature. The "discomforts of being outside" and "doing fieldwork" were mentioned a few times in regards to this question. However, results do show an overall increase of significance. Mayer and Frantz (2004) report that the CNS measures how interconnected a person feels with nature, and most MYLES students felt more connected based on both quantitative and qualitative data. This section will discuss the findings in more detail. Recommendations will also be made for future research.

Discussion

MYLES appeared to have the right combination of elements to increase teens' CNS scores. The overall CNS score increased and this increase was considered statistically significant (see Table 2). Furthermore, CNS scores increased for most participants, as 56% of scores went up (see Figure 1). These findings agree with other connectedness to nature studies, which show that EE programming can positively influence CNS and/or INS scores in children (Ernst & Theimer, 2011; Johnson-Pynn et al., 2014; Lieflander et al., 2014). Findings also show that the expeditionary science program (MYLES) improved teens' connectedness to nature, just as a

similar immersion program enhanced teens' environmental sensitivity (Metzger & McEwen, 1999). MYLES brought students closer to nature so that they could study ecological concepts and science in a hands-on way (MYLES of Science, 2015). In handling snails and salamanders, and in order not harm them, MYLES students reported becoming more aware and sensitive to the creatures and habitats they were studying. It seemed that during MYLES, students' increased sensitivity to nature led to more nature connectedness. This is comparable to the Metzger & McEwen (1999) study, where student journals reflected sensitivity to the environment and deeper connections to nature while learning about and exploring its habitats and creatures.

Qualitative results highlighted more of the students' perceived impacts on their connectedness to nature. Many themes emerged from the three open-ended questions. From question 2 (Did any part of the MYLES experience cause you to feel more connected to nature?) the following themes emerged: nature immersion (70%), wildlife encounters (25%), enjoyment of nature (18%), and knowledge about nature (13%). Results suggest that the nature immersion element of MYLES was an important part of feeling connected to nature, a finding supported by other studies (D'Amato & Krasny, 2011; Haluza-DeLay, 2001; Metzger & McEwen, 1999). Haluza-DeLay (2001) found that teens expressed being connected to nature while immersed in it, and this agreed with the MYLES study as most teens were still in nature when they took their posttest (53 out of 57 students took the posttest in the wilderness while camping). Three out of four teens that took their posttest in the library (due to unforeseen circumstances) still had increased CNS scores. This could be because the MYLES group went straight from the National Park to Montreat College and had not been out of the wilderness for more than a few hours. One MYLES student (a male, who took his posttest in the library) wrote in response to question 1 (What does connectedness to nature mean to you?), "Nature is magical and beautiful and

connecting with it means experiencing and becoming one with it."

D'Amato and Krasny (2011) found that outdoor adventure education courses increased participants' connections to nature. Journal entries reflected that 1) extended immersion in nature, 2) increased comfort outdoors, and 3) transformational growth, were the cause (D'Amato & Krasny, 2011). Many MYLES students noted immersion in nature as a connecting experience. One returning male student wrote, "Spending this much time in nature makes me feel connected to it." Hiking and backpacking, part of the immersion theme, were mentioned several times by students as leading to greater connectedness to nature. One student wrote, "When we hiked and backpacked through the forest, I felt more connected to nature." At least two students wrote about the plant and animal knowledge of instructors, and how this inspired them to feel more in tune with (and connected to) nature. From one student, "Our leader knows a lot about plants and he and she would tell us about them." Some students expressed feelings of belonging to a greater cycle of life. A returning MYLES student wrote, "When I was just laying down, and hanging out quietly at the creek, I felt more related (than in a long time) and connected to the world around me." Students from the Greffath et al. wilderness study (2012) exclaimed that being out in the environment for 5 days was unique to their experience of connecting with nature and other students, and that they could not have felt as connected if they had been in a building or classroom. MYLES students had a similar sentiment- that being immersed in the natural world caused connectedness to nature to increase.

Seeing wildlife was another connectedness to nature influence during MYLES. Wildlife encounters were listed by 25% of respondents as important (see Figure 3). Kids expressed sensitivity, excitement, and awe when being in contact with or in the presence of salamanders, black bears, and elk. The reaction of the students to wildlife is consistent with E. O. Wilson's

biophilia hypothesis that talks about humans' innate ability to find a kinship with other life, notably animals (Wilson, 1984). This concept is well expressed by one MYLES student, "When we saw wildlife and it saw you and there's a brief second where the feelings mutual." D'Amato and Krasny (2011) listed awe-inspiring nature as a significant influence on connectedness to nature. A female student new to MYLES said, "I saw an adolescent black bear and it was minding its own business. It was incredible." Kals et al. (1999) discovered that direct experience in nature, like an encounter with wildlife, helped establish a person's emotional affinity towards nature.

Knowledge played an important role in the MYLES teens' expressions of nature connectedness. As E.O. Wilson (1984) describes in Biophilia, "Our sense of wonder grows exponentially: the greater the knowledge, the deeper the mystery and the more we seek knowledge to create new mystery" (p. 10). Avery (2013) noted that rural children acquire science knowledge and skills throughout their lives, since they are often working and playing outside in wild areas (and/or on farms). Yet, studies show that most people now live in urban areas (Goleman et al., 2012) and are losing touch with nature (Beery et al., 2015). Programs like MYLES could help to reconnect high school students with nature. For example, the Great Smoky Mountains National Park provided a rich environment for learning science on the MYLES expedition, and provided the impetus for teens' scientific inquiry. Bischoff et al. (2008) did research on how to recruit high school students into science careers. His research was prompted by a question of why students were disengaged from science. He found that interest and knowledge increased after camps consisting of hands-on science in the outdoors (Bischoff et al., 2008). Students often referred to how much they learned while being out in the elements, like when testing water quality, and showed more improved learning than when in a classroom

environment (Bischoff et al., 2008). Therefore, the very nature of expeditionary science promotes teen relationships with nature, and could also improve their science interest and knowledge. A returning female student of MYLES wrote that "learning about all of the different types of snails and salamanders helped me realize how many different types of organisms there are in nature" which was why she felt more connected. This agrees with the Henderson et al. (2010) summer camp research where students interviewed stated the more they learned about nature, the more they cared about it.

Enjoyment of nature actually emerged as a more significant theme than knowledge in building nature connections (see Figure 3). Teens in the Haluza-DeLay study in Canada (2001) defined nature as "without people, natural in character, and not human-made" (p. 46). The teens felt like nature was nonexistent at home in an urban area because real nature was wilderness (Haluza-DeLay, 2001). The Canadian teens enjoyed nature most while climbing and caving (2001). The young adults in the Greffath et al. (2012) study got enjoyment out of cooking their own food and collecting their own water. In similar fashion, MYLES students enjoyed solitude, natural scenery, serenity, and peacefulness as part of their wilderness excursion. Some also expressed trepidation about returning home, where there was not as much nature. One MYLES student said that nature at home was different, and that manmade objects (like cars and corporate buildings) were not a part of the natural world. This expression shows similarity to a statement in the Haluza-Delay study (2001) where a teen said that nature was no longer found at home after development of a subdivision took place. Teens, from both MYLES and Haluza-Delay's (2001) research were not sure how connectedness to nature would play out back home.

Being in nature during MYLES appeared to relieve some stress, and allow the teens a reprieve from busy lives. Participants of MYLES alluded to nature's stillness, silence, and

separation from society as reasons why they felt more connected to nature. These expressions are in agreement with Logan and Selhub's (2012) findings that nature calms human beings. Escape from society was also expressed as an improvement in nature connectedness during MYLES. Participants in this research stated that being away from technology (cars, phones) was a relief. MYLES was unique in that cell phones were not allowed on the program, even when used as cameras. The research by Gomes (2012) confirmed that college students could take a break from certain technologies and reconnect with the world around them. Gomes (2012) found that it did not take that long (less than a week) for young people to realize how connected they were to technology and how disconnected they were from the outside world. One student of MYLES expressed that having no technology was what connected her more to nature, yet her CNS score decreased by almost 1 point (4.43 to 3.57). Since having no technology made her feel "less like a bystander to nature" and more connected, perhaps taking her post CNS in the library (where there was electricity and a computer) caused her CNS score to go down. However, for students taking the CNS in the library there was no significant effect overall (see Table 5). Therefore, it is unclear as to why her score decreased.

Based on qualitative results, an increase in CNS scores appeared to be a result of the experiences had in nature that enhanced teens' feelings of oneness with the natural world, filled them with awe and excitement, and enriched their lives with knowledge and awareness of nature. Also, MYLES students found increases in their connectedness to nature through affective experience, more than through cognitive learning. Since studies show that environmental knowledge alone does not trigger pro-environmental behavior (Mayer & Frantz, 2004), programs intended to boost conservation behavior should include affective experiences. Although the MYLES study did not look at intentions of being pro-environmental, research does show that

when connectedness to nature increases, so does pro-environmental behavior, at least in the short term (Geng et al., 2015; Hoot & Friedman, 2011). It seems likely then that expeditionary science programs like MYLES could influence at least short-term pro-environmental behavior.

MYLES CNS scores decreased for some participants (30%) and stayed the same for others (14%) (see Figure 1). Johnson-Pynn et al., 2014 found that CNS scores decreased more in urban youth than in rural youth (of Uganda). Rural youth had more experience in the countryside and were more comfortable in nature's elements than urban youth (Johnson-Pynn et al., 2014). The MYLES demographics did not gather information on urban vs. rural backgrounds. However, there are 80 rural counties in the state of North Carolina, 14 suburban counties, and 6 urban counties (The Rural Center, 2016). Students in MYLES were recruited from all over North Carolina and there are more rural counties. Two of the students (whose CNS scores decreased) mentioned returning to seemingly urban lives with cars, corporate buildings, and houses as factors that kept them from feeling more connected to nature. Urban teens of the Haluza-Delay (2001) study also felt apprehensive in returning to the city after their wilderness experience. Perhaps some of the urban students of MYLES felt more disconnected from nature since they were returning home. This was the case in the Haluza-Delay (2001) study. When interviewed after their 12-day wilderness program, the students (from a city) felt like the idea of going home made them feel more disconnected from nature (Haluza-Delay, 2001).

Ugandan females were more likely to have CNS scores that decreased after outdoor programming (Johnson-Pynn et al., 2014), which was opposite of the MYLES findings. MYLES results showed that 14 males and 3 females had a decrease in CNS scores. The males reported that they already felt connected to nature on their own, but were slightly bothered by the backpacks, bugs, and/or other campers. In Uganda, females do a lot of chores in nature (like

collecting water) and results found that camping felt like another outside chore to them (Johnson-Pynn et al., 2014). Only one female complained about the camping in the MYLES questionnaire. The other females felt that they were bothering or harming wildlife when handling it during field science work. One female, new to the MYLES program, stated that "realizing plants and animals have a life too" made her more aware of the human impact on nature.

The science work was listed in 9% of the MYLES student answers as causing them to feel less connected to nature (see Figure 4). Being a field science program, the students worked collecting and analyzing data at times for an entire day, and usually for more than half of a day. Scientists express that studying nature can objectify it and cause feelings of human and nature disconnect (Sampson, 2014; Wilson, 1984). Sampson (2014) wrote that when we: "measure it, test it, and study it, with the ultimate goal of unraveling its secrets" (p. 1) we turn nature into objects, not subjects. One MYLES student had this reaction while studying salamanders. He felt awestruck by finding the salamanders in their habitat, but felt more disconnected to nature when "breaking their habitat in the name of science." This was also reflected in his post CNS score that went from 3.71 to 3.64. Discomfort in the wilderness was mentioned more often as a reason that MYLES teens felt less connected to nature. Listed by 13% of students, some discomforts were expressed as having a negative effect, such as using the bathroom outside to defecate, having no showers, and bothersome insects. Otherwise, the students seemed to like being outside for a week. D'Amato and Krasny (2011) found that most young adults in their study appreciated the ruggedness of the nature immersive lifestyle. A few of their students expressed dissatisfaction in spending so much time in the wilderness away from usual daily comforts, but more students felt that the new way of living outside was a transformative, life-changing

experience (D'Amato & Krasny, 2011). When asked what about the MYLES experience made a student feel more connected to nature, one female student (new to the program) responded, "Because we slept outside, went to the bathroom too. Also because I learned we do processes just like nature." This MYLES student made nature connections from her body's own natural processes.

Limitations

Research on the MYLES expeditionary science program was limited to one summer of collecting data (n=57). Three summers of data could have been gathered, as the grant-funded program ran from 2014-2016. Due to time constraints of the researcher, however, all MYLES students (N=200) were not surveyed. Also, several other studies done used graphical measures (such as the INS scale) in conjunction with the CNS questionnaire to assess quantitative changes in connectedness to nature. The MYLES study used only one quantitative measure, the CNS, which may have limited the study. However, in using a mixed-methods design for the MYLES study, descriptive information was gathered from the students using open-ended questions.

MYLES' program goals did not state any intention of affecting students' connectedness to nature. Rather, the MYLES program goals were to increase interest in science and to immerse students in wilderness surroundings in a way that promoted environmental learning (MYLES of Science, 2015). The researcher could have chosen a program to study that had a goal of changing students' connectedness to nature. However, MYLES was ideal to study since it was based out of Montreat College, where the researcher was in graduate school.

The error made while constructing the CNS pre- and post- tests was a limitation, because question #9 was left out of 35 CNS tests. Although using the "missingness" concept ameliorated the mistake, it would have been better to have all CNS data correctly gathered. Also, four

students took the CNS posttest in the library and not in the field. Although this had no significant effect on posttest results, the majority of the students took their posttest in the field, which would have been ideal if all posttest data had been gathered in the same way.

Recommendations for Future Research

It is recommended that this study be replicated with other similar expeditionary science programs. In addition, any demographic information gathered could include a question on whether a student is from a rural or urban area. This would be important as more people move to urban areas, and the rural human population shrinks. Information on students' formative influences needs to be gathered before the CNS pretest, to determine what formative influences may impact the potential change in nature connectedness. Additionally, questions could be added to the posttest in regard to future intended pro-environmental actions, if this is of interest in the study.

Perhaps most importantly would be a long-term follow-up CNS survey, given to 2016 MYLES participants. A follow-up would help to determine if the change in CNS scores was permanent or temporary. Gathering data on future environmental intentions also could be interesting. Much research on formative influences of youth does not actually follow a young person as they grow up. It might be beneficial to formative influence research to follow a person's connectedness to nature as they age (perhaps from age 7-17) in order to see what career they choose and what environmental choices they make.

Recommendations for Practice

Findings from this study support environmental programming for teens that is immersion based, involve EE strategies, and remove technology. The MYLES students expressed a variety of reasons why nature immersion helped them to be more connected to nature, like multiple days

in the woods, sleeping outside, hiking, and backpacking. Therefore, adding these components to EE programs and camps could be a good idea if increasing nature connectedness is a goal. Wildlife encounters made an impression on teens, so encouraging them to see wildlife and making efforts to find wildlife could boost a program's effectiveness on connectedness to nature if that is a goal. Young people appreciate awe and wonder, and seem to find it in wildlife encounters, in seeing beautiful scenery, and during quiet times of reflection. Keeping discomfort to a minimum may be important, although the MYLES teens did not find backpacking and camping as uncomfortable per se. Rather, they expressed some annoyance at bugs and at having to do science work. However, there were very few MYLES students who complained about any elements of the program. It may be important to keep in mind that the science work should be balanced with time to reflect, to relax, and to watch and enjoy scenery and wildlife.

Conclusion

The main contribution of this study is in adding to the research on expeditionary science. Based on the findings of the study, it can be concluded that an expeditionary science program like MYLES can increase teenagers' short-term connectedness to nature. Feeling more connected to nature could be good psychologically as humans are more and more removed from nature, and since nature promotes calm. After all, teens lead busy lives and are inundated with technology daily. Teens in the MYLES study welcomed the calm that nature provided, even as they were backpacking, camping and hiking in the wilderness. Teenagers also felt excitement and awe and developed a love of the creatures they were studying (like snails and salamanders). Many MYLES students described nature immersion as what helped them to feel most connected to nature. Some also made reference to enjoying the time away from their homes, cars, and buildings. It can be concluded that teens are able to connect with nature and perhaps are a good

age group to reach out too when a program's goal is to promote connectedness to nature. Most importantly, it should be noted that expeditionary science and EE programs add to childhood formative experiences. Formative experiences that build on connectedness to nature may impact conservation and pro-environmental behavior in the long run.

Overall, MYLES was a program that enhanced students' affective connections and in turn boosted their connectedness to nature. In order to facilitate emotional connections, programs should not focus on knowledge for knowledge sake, but include time in nature just to experience it. Learning things about nature could be woven into a program (but not forced) through hands-on science and by educated and knowledgeable staff. In this way, the students can make both cognitive and affective connections to nature while immersed in it, and perhaps find themselves empowered later when making decisions about the natural world.

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APPENDIX A

CONNECTEDNESS TO NATURE SCALE (CNS)

Please choose one answer and fill in the blank with that answer

1=strongly disagree 2 3=neutral 4 5=strongly agree

1. I often feel a sense of oneness with the natural world around me ___
2. I think of the natural world as a community to which I belong ___
3. I recognize and appreciate the intelligence of other living organisms ___
4. I often feel disconnected from nature ___
5. When I think of my life, I imagine myself to the part of a larger cyclical process of living ___
6. I often feel a kinship with animals and plants ___
7. I feel as though I belong to the Earth as equally as it belongs to me ___
8. I have a deep understanding of how my actions affect the natural world ___
9. I often feel part of the web of life ___
10. I feel that all inhabitants of Earth, human, and nonhuman, share a common "life force" ___
11. Like a tree can be a part of a forest, I feel embedded within the broader natural world ___
12. When I think of my place on Earth, I consider myself to be a top member of a hierarchy that exists in nature ___
13. I often feel like I am only a small part of the natural world around me, and that I am no more important than the grass on the ground or the birds in the trees ___
14. My personal welfare is independent of the welfare of the natural world ___

APPENDIX B

MYLES PARENTAL CONSENT FORM

Dear Parents/Guardians of 2016 MYLES participants,

My name is Blair Ogburn and I am a graduate student at Montreat College. I am also the past Director of MYLES of Science (MYLES). I am using my thesis work as an opportunity to understand expeditionary science programs like MYLES. I would like to see if the MYLES experience changes how teen participants feel about their connectedness to nature.

During the program, your child will be exploring a national park and doing scientific research. He/she will be camping and backpacking in amazing places. I know it will be a rewarding (and maybe even life-changing) experience. I am sure your student will come home filled with excitement and stories.

Participants this summer will be asked to fill out a Connectedness to Nature Scale (CNS) before and after their MYLES experience (a short 14-question survey, professionally developed by researchers). I need permission for each student to take this survey.

Please note: Students' responses will be kept confidential under all circumstances. No student names will be used in the writing of my research paper. *You are welcome to a copy of this research upon completion.*

**I request your consent to use your child's survey answers for my research project. The results of my thesis may lead to an increased understanding of expeditionary science for teens. Thank you for considering this.

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*Please return this consent form, **in person, or via email,** by the check-in date of your child's MYLES program. I will gladly answer any questions you have by phone or email. My number is 828-508-6652 and my email address is blairogburn@gmail.com.*

Please check the box below that indicates your consent, and please sign/date the form also.

☐ YES-I give consent for my child to take the CNS questionnaire, and for this information to be used in the above listed research.

☐ NO- I do NOT give consent for my child to take the CNS questionnaire, or for this information to be used in the above listed research.

_____ _____

Parent/Guardian Signature Date

Sincerely, Blair Ogburn/ Past Program Director, MYLES

APPENDIX C

BWF SSEP Student Feedback Survey

BWF Student Science Enrichment Program STUDENT FEEDBACK SURVEY Grades 6-12

For office use only: Project #: ___ ___ ___ Cover #: ___ ___ ___ Survey #: ___ ___ ___

Instructions: You may use either pen or pencil to complete this survey. On page 1, circle numbers clearly. On page 2, fill in circles completely. Draw an "X" through incorrect answers. Thank you for taking time to tell us what you think about this program. Your ideas are important to the people who designed this program.

About this program

1. Please tell us how you feel about each of the following statements by circling one number on each 5-point scale (1-5).

Circle one answer for each statement.

a. This program helped me understand science better.

b. Because of this program, I feel better about being able to learn science.

c. I learned some things in this program that I can use in science class at school.

d. Because of this program, I think I am more aware of the importance of science in everyday living.

e. I tell my family or friends about the things we do in this program.

f. Because of this program, I am more excited about science.

g. Because of this program, I think I have a better understanding of what 12345 scientists do.

2. Please tell us how you feel about this program by answering each of the following questions. Circle one answer for each question.

a. Would you like to participate in another program like this?

Yes No Maybe

1 2 3

b. Would you recommend this program to a friend?

1 2 3

About you

5. How would you describe yourself as a science student? Circle one. (1=not at all interested,

5=very interested)

6. How would you describe your interest in science before this program? Circle one. (1=not at all interested, 5=very interested)

7. Has this program changed your feelings about learning science? Fill in the appropriate circle. O Yes, I am more interested in learning science. O Yes, I am less interested in learning science. O No, my interest in learning science has not changed.

8. Has this program encouraged you to think about taking more science in the future? Fill in the appropriate circle. O Yes, I am thinking about taking more science classes in the future. O No, I am thinking about taking fewer science classes in the future. O My thoughts about taking science classes in the future have not changed.

9. Has this activity encouraged you to think more about getting a job in a science-related career? Fill in the appropriate circle.

O Yes, I am thinking more about getting a job in a science-related career. O No, I am thinking less about getting a job in a science-related career. O My thoughts about getting a job in a science-related career have not changed.

8. What job areas are you most interested in? Fill in the appropriate circles. Choose all that apply.

O Agriculture O Arts/Entertainment O Business

O Education/Teaching O Health Care/Medicine O Law

O Science O Sports O Technology/Computers

O Other job area, for example: _____

9. If you selected “Science” in question 8, which of the following areas of science are you most interested in? Fill in the appropriate circles. Choose all that apply. If you did not select “Science” in question 8, please skip to question 10.

O Biology O Biomedical research O Biotechnology

O Chemistry O Computer Science O Engineering

O Environmental Science O Forensics O Physics

O Other area of science, for example: _____

10. What is your gender? Fill in the appropriate circle. O Male O Female

11. Which of the following best describes you? Fill in the appropriate circle. Native Asian/Pacific Bi- or

Black White Hispanic/Latino American Islander Multi-racial Other

OOOOOOO

12. What grade are you in? If this is a summer program, what grade will you be in when school starts again? Fill in the appropriate circle.

5th 6th 7th 8th 9th 10th 11th 12th freshman in college

OOOOOOOOO

13. In what North Carolina COUNTY do you live? For example: Alamance, Bertie, Cumberland, etc. _____

Thank you for sharing your thoughts with us! The Program Evaluation Group (TPEG), LLC

The Program Evaluation Group, LLC. (2012, May). Pittsboro, NC: Burroughs Wellcome Fund. Retreived from https://www.bwfund.org/grant-programs/science-education/student-science-enrichment-program/evaluation.