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Can Engagement In The Natural Environment Reduce Stress In Gifted Students

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CAN ENGAGEMENT IN THE NATURAL ENVIRONMENT REDUCE STRESS IN GIFTED STUDENTS

by

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CHAPTER ONE

Introduction

As a ten-year-old fourth grader in a public school, my class was given a period of "choice" time. Choice time allowed us students to play board games, complete puzzles in partnerships, or explore and share books. Essentially, the purpose of choice was to encourage social interactions and build peer relationships. My choice was to peruse the "V" section of the encyclopedia, and in doing so, I encountered a page on Venus Fly Traps. I was stunned by the existence of a plant that challenged my entire understanding of the food chain! I frantically tried to share this new finding with my peers, but my classmates were not as impressed. Feeling rejected and unable to regulate my emotions, silent tears fell onto my desk as I realized my peers thought I was "weird" for being so curious about the amazing nuances of nature. I became more socially withdrawn and worried about peer perceptions. Although my curiosity with the natural world did not cease, my active engagement in the classroom environment did, as I was stressed that I would bear further scrutiny from my peers.

I knew that I earned high marks on my school work, and was regarded as a straight - A student, but I did not know that there was a label for high academic achievement and ability. My understanding was that I was smart, and to challenge me, teachers placed me in groups for high achievement - this entailed being placed with

students in higher grades for some subjects. Unfortunately, my peers did not see this necessarily as a positive, but rather as different, so relationships with my peers continued to widen as I recused from social interaction. In doing so, regulation of my emotions seemed to be out of sync in regard to my cognitive development. In addition, I experienced heightened levels of stress and anxiety.

I lacked regulation of stress and feelings, until a field trip with my class allowed me to engage with nature and learn how we connected with the natural environment. Soaking up as much information as I possibly could, I did not worry whether or not my classmates considered me “odd” for being insatiably curious. Finally free of anxiety and stress, I felt confident, connected, and had comfort in the natural environment that surrounded me.

For these personal reasons, I pursued a Gifted and Talented Certificate after obtaining my teaching license, as I knew I wanted to teach not only academic extensions, but also empower gifted students with social and emotional curricula so they could understand their own idiosyncrasies, embrace them, and learn coping mechanisms to reduce stress and anxiety. I want gifted students to understand what truly motivates them; to encourage them to take academic, social, and emotional risks; and to maintain their natural curiosity while minimizing outside stress.

Gifted students tend to be perfectionistic, literal in self evaluation or criteria, yet abstract with ideas and connections (Bailey, 2011). They can be self doubting, extremely curious, sensitive, energetic, and morally just (Bailey, 2011). In addition, they can have

elevated stress and anxiety (Bailey, 2011). Gifted students may also have asynchronous development. Asynchronous development can take on many forms depending on the child, but could involve extreme academic ability in some subject areas and underdeveloped or average development in other areas. It could be witnessed as mature social interaction and conversation, yet also manifest as undeveloped emotional regulation and catastrophic reactions to mistakes (Bailey, 2011). The manifestation of asynchronous development can lead to elevated levels of stress.

My first students in the gifted classroom displayed a continuum of these social and emotional characteristics and needs. One particular student was so stressed over being "perfect" that he initially refused to write. Probing into this student's challenges, I found this student reduced stress by weeding his family's garden and observing the pet garter snake the family found in the garden. Tapping into these resources of placidity, I opted to adopt a class pet: a tree frog. During perceived levels of elevated stress, we would pause and observe its behavior: sticky fingers on the glass, the vocal sac, and the relentless consumption of crickets. Reflecting over the time with this class pet, I realized it had helped to instill a sense of calmness in the classroom.

Another student in my classroom had such heightened stress that any ambiguity in directions, any misinterpretation or perceived dissonance between what this student believed she was capable of and what was being asked, would temporarily immobilize the student. The negative self talk and self doubt was making this student believe her worst fears. Using my own personal experience of engagement with nature to feel more

confident, I encouraged a shift of focus into investigating the class cactus and its long, shaggy, white hairs. After interacting with the cactus, the student was able to communicate her needs and choose positive words about her understanding and abilities to accomplish the task. Based on these experiences, I found myself more intrigued with the role of nature in the classroom and the benefits the presence of nature might provide as it relates to stress and the gifted child.

Many students seem to be disconnected with nature, especially gifted students. These students have numerous activities and events with limited time to relax and explore nature (Allen, 2013). They are in advanced academic classes, taking a second or third language, learning to code, playing one or more musical instruments, and involved in one or more extracurricular activities. For these students, there simply is no scheduled time in the day to pause and reflect on the natural world surrounding them.

Gardner (1997) indicated there are eight multiple intelligences, and Naturalist is one of them. However, there are little to no resources to tap into this Naturalist intelligence, especially on a day to day schedule, like there are for the other intelligences (Linguistic, Logical, Visual). Comparing subjects, language arts (Linguistic) and math (Logical) are the main focus, as standardized testing captures this data year over year, whereas science (Naturalist intelligence), as a standardized test, is not measured annually. The natural world (Naturalistic intelligence) seems to inherently get the least amount of academic attention and materials.

Therefore, “Can engagement in the natural environment reduce stress in gifted students?” is the topic of my research. I want to research whether engagement in the natural environment can reduce stress levels for gifted students and if this engagement can transfer to increased levels of outdoor activities and have a positive impact on emotions.

CHAPTER TWO

Literature Review

My research aims to examine "Can engagement in the natural environment reduce stress in gifted students?" Before delving into how to engage students, and what methods can be applied and practiced to reduce stress, it is first important to understand and define "gifted children." According to the National Association for Gifted Children (NAGC) (2006), "gifted individuals are those who demonstrate outstanding levels of aptitude (defined as an exceptional ability to reason and learn) or competence (documented performance or achievement in top 10% or rarer) in one or more domains" (p. 1). Domains are defined as areas of structured activity or sets of sensorimotor skills and measure talent in intellectual, creative, artistic, leadership and academic areas (NAGC, 2016). Academic talent is observed when students conceptualize material in specific subject areas and perform at substantially higher levels than their chronologically aged peers. Intellectual talent is observed when students show a keen power of abstraction and think of concepts in analogies. Artistic talent lies within the art students practice and differs from the creative talent, where students are intuitive and find unique solutions to problems. Leadership talent is observed when students plan backwards from a goal and find sequential goals that can be solved individually or employed to other members focusing on the same goal. This chapter will seek to explore the impact of sensory

experiences on gifted students, the degree to which gifted students interact with nature, and the complex nature of emotions in gifted children.

First, it is important to consider the definition and the intricacies of sensorimotor skills. Naturally, sensory experiences are inclusive of the five senses; but how do taste, touch, smell, sound and hearing impact cognitive reasoning and affective behavior, especially for elementary students? In the section below regarding sensory experiences, I will acknowledge Dabrowski's work on the excitable gifted child and his/her overexcitabilities (Mofield, 2015), which will allow us to better understand the sensory intricacies of gifted students as manifestations of energy and internal processing of experiences.

Next, essential to the research are examinations of both what the natural world is comprised of and how people interact with it. Researchers and philosophers are not in agreement about the directionality of the relationship between humans and nature: do humans interact with nature or intra-act with it? The main difference is focusing on whether humans are truly independent from the elements of nature and separate from nature, or whether humans are a part of nature (Malone, 2016). Further, it is important to examine the various ways that students can interact with nature (passively or actively) and determine if interaction is a continuum or distinct stages. I will also explore whether intentionally placing the natural world into the classroom (and in what form) differs significantly from intentionally placing students into the natural world (and in what form).

Lastly, understanding the complex nature of emotions and the impact experiences have on the gifted student will need to be explored to best determine if stress in these students can be reduced. What seems to be causing the heightened levels of stress and anxiety, and is there truly a difference between gifted students and their nongifted peers? What experiences draw out different emotions and is there a positive correlation between positive self-concepts and interaction with the natural world? The last section of this chapter will seek clarity on these questions.

"Can engagement in the natural environment reduce stress in gifted students?" is therefore a question with many layers. It is important to carefully analyze not only what constitutes a gifted child, but how these children perceive the world through their senses. Thorough analysis of research--pertaining to sensory implications for gifted children, how gifted children might interact with the natural world, and gifted children's emotions--will help build the foundation of perhaps why engagement with the natural world may help to reduce stress in gifted students.

Sensory

There is substantial research regarding the sensory intricacies of gifted children. Children experience the world through their five senses and build neurological pathways and cognitive understandings through these sensory experiences (Papalia et al, 2006). Dabrowski identified five areas of intensity--which indicate a heightened ability to respond to sensory stimuli--and has called these intensities "overexcitabilities." The five

overexcitabilities are *psychomotor*, *sensual*, *intellectual*, *imaginational* and *emotional* (Tolan, 1999).

Psychomotor overexcitability is observed by high energy: a student "on the go" who can also retain focus for a long duration. Gifted students tend to learn with less repetition of content and need less extensive explanations in class (Eide, 2004). Gifted students in a classroom environment in which content knowledge is repeated often experience a build up of energy that may take the form of nail biting, pencil tapping, rapid talk, or impulsive physical behavior (Mofield, 2015).

Sensual overexcitability is a heightened awareness and sensitivity to one or more of the five senses. This excitability can manifest as both an attraction to particular things and an aversion to particular things (Lamont, 2012 and Mofield, 2015). Gifted students with this observed intensity may, for example, be picky eaters (dislike or be sensitive to taste, texture or sight), eat for pleasure not sustenance, be attracted to textures of clothing or objects, have an affection for jewelry, or have a heightened need to be touched or given affection because they are essentially seeking an outlet for inner tension (Lamont, 2012 and Mofield, 2015).

Intellectual overexcitability is characterized as a need to make complex connections and "an intensified and accelerated activity of the mind" (Mofield, 2015). These students are always seeking the "How?" and "Why?" behind experiences, value learning versus achievement, and enjoy data analysis and theoretical thinking (Lamont, 2012 and Mofield, 2015).

Individuals with *imaginational overexcitability* tend to rely on a "release of emotional tension through the imagination, as manifested in daydreaming, animism, and distraction" (Mofield, 2015 p. 409). This excitability can be exhibited by extreme creativity, whereby children may create, imagine and "live" in the fantasy worlds they have connected with mentally through physical experiences. This connection of experiences may be from ideas exposed to them through literature or from natural experiences. Just as with the sensual overexcitability, this creative world could be filled with positive or negative fantasies resulting in fear, anxiety, or despair. Children with imaginational overexcitabilities may be inventive, find unique solutions, use metaphors in verbal language, or have strong visualization of images (Lamont 2012 and Mofield, 2015).

Emotional overexcitability is observed in various ways. Students with this gifted characteristic may be shy, nervous, or anxious, or they may express extreme concern or care for other people, animals, or inanimate objects They experience life with intense emotions (LaMont, 2012).

Although the senses are identified as taste, touch, sight, smell and sound, they are not necessarily processed in isolation. Through integration of the senses with knowledge and skills in reflection, and scientific inquiry, gifted children are able to critically analyze and problem-solve. They might initially use the senses to draw understandings about the environment, but will then be able to connect those understandings to possible human

environmental impact and the ethical role humans have to care for the environment (Auer, 2008).

Students, Emotions, and the Natural World

There is considerable research pertaining to students interacting with the natural world, and in this section, *environment* and *natural world* will be used interchangeably. Yet, it is important to ask "what is the natural world to a child?" To answer this question, it is important to consider the definition of nature according to a champion in the movement of returning children to nature, Richard Louv (Malone, 2016). Louv, the American-based journalist who wrote the book *Last Child in the Woods* (2005), defines nature as anything "not human-made in the physical environment...wilderness, biodiversity, abundance -- related loose parts in a backyard or a rugged mountains ridge" (Malone, 2016, p.9). Malone (2016) challenged Louv's idealistic view of nature, perceiving him as implying that nature is divided from humans. Malone challenges that the natural world is not an inanimate object that humans interact with, where humans are dominant and the elements in nature are objects that we take turns connecting with independently. Malone says interaction is not the infrequent connection between independent existences. Rather, the natural world is its own subject, and all the elements that make up the natural world and a "place" (that humans and nonhumans occupy) coexist and we actually intra-act with these elements because we are interdependent

(Malone, 2016). In order to explore our interdependence with nature and how to intra-act with these elements, we need to understand the types and varying degrees of engagement.

According to Stevenson (2014), engagement with the natural world can be categorized in three ways: indirect experiences such as watching or reading nature based media (television, movies, magazines, books), direct contact with nature or time spent in nature, and the influence of role models promoting environmental education and stewardship. Although qualitative studies indicate these three forms of interaction with nature have a positive correlation to environmental knowledge and behavior (both immediate and long term), Stevenson was interested in investigating whether that correlation would hold true in a quantitative study. Stevenson thus set out to investigate environmental knowledge and behavior in adolescents, choosing a middle school context because it "represents a period in which children possess the cognitive development necessary to evaluate environmental issues and capacity to be influenced" (p. 166). Through this study, Stevenson found a negative correlation between indirect contact with nature--watching nature-related television--and environmental knowledge. However, she also found weak--but positive--correlations between direct contact with nature--either alone or with groups--and students' knowledge and behavior (Stevenson, 2014).

Similar to Stevenson (2014), Keniger (2013) concluded there are three ways you can interact with nature: indirect, incidental, and intentional. *Indirect interaction* with nature is when people experience nature without physically being in it. This can be through viewing images of nature, whether through posters, pictures, movies, or a

window. *Incidental interactions* with nature are when you experience nature as a side effect of another activity. This can include interactions through encountering vegetation indoors, such as plants or walking, biking, or driving to work. *Intentional interactions* with nature and the natural world are experiencing nature through direct, purposeful intention. Taking a hike, gardening, viewing wildlife (birds, animals, landscapes), camping, or other recreational activities would encompass intentional interaction. Han (2009) similarly identifies that interaction with nature and exposure to the natural world encompasses sensing vegetation, skies, and bodies of water for an unspecified period of time.

Keniger (2013) concluded that students who had indirect interaction with nature showed improvements in cognitive functioning, especially sustained focus. Specifically, Keniger states that "cognitive performance of students, as measured by three directed attention tasks, was significantly improved after viewing pictures of natural scenes rather than urban areas" (p. 923). Additionally, physiological studies indicate that viewing pictures of vegetation and landscapes reduce stress levels (Keniger, 2013).

Regarding incidental interactions with nature, Keinger found inconsistent results. Incidental interactions--such as walking on a tree-lined street versus a busy city street--showed that cognitive performance was enhanced by exposure to nature (Keniger, 2013). However, two separate studies that included plants in the classroom had contradictory results. One study showed a beneficial cognitive result, whereas another study --that measured cognitive performance through three directed attention

tasks--actually demonstrated “that cognitive performance declined with increased density of indoor plants” (Keniger, p. 923). Neither study, however, investigated the impact of nature on anxiety or stress levels.

Intentional interaction with nature, such as participating in a structured community garden or interacting with wildlife in a natural environment has been shown to improve many social aspects such as social support, connections, and social networking (Keniger, 2013). In a review of research, Keniger (2013) found a study that measured stress levels through enzymes in saliva before and after exercise in forest and urban environments. The research concluded that physiological effects of stress were reduced in forest environments. Further, Keniger (2013) also found a study in which stress induced headaches were minimized for subjects who had intentional interaction with nature.

Intentional interaction with nature has social-emotional and physiological benefits, but can also aid in emotional regulation and affective restoration. Affective restoration is when exposure to the natural environment restores cognitive function, and thereby enables emotional regulation (Johnsen, 2013). Johnsen’s research (2013) refers to Ulrich’s 1993 work in identifying a psycho-evolutionary theory that states that humans have “evolved restorative responses to nature” (p.799). Johnsen (2013) references research that confirms exposure to a natural environment (after watching a frightening movie) improves mood over being in a man-made environment. Further, Johnsen (2013) also refers to a research where 15 second exposure to nature photos improves attention.

Han (2009) studied the effects that interaction with the natural world had on emotions as measured by affective self-reports. In this study, Han specifically measured how incorporating live plants in a classroom would affect emotions and mental states. Han's research has indicated that people who view potted flower plants had more reduction of stress levels and an increase of relaxation, happiness, and overall well-being. Han's research also measured physiological responses to the natural world and found a reduction in blood pressure and an increase in attention after exposure to indoor potted plants. Additionally, Han's research indicated that processing speed, as measured by reaction time on a computer task, was increased when potted plants were in the classroom (Han, 2009).

Johnsen (2013) also found correlations between natural experiences and positive emotions. As a measure, Johnsen used two natural environment settings and a photo of balloons. There was a control group who viewed the photo of balloons for distraction, an experimental group who viewed one natural environment setting as a distraction, and a final experimental group of participants who used both natural environment photos to actively reflect upon when they were having negative emotions. Johnsen (2013) concluded that using nature for emotional regulation had a positive effect on mood. Specifically, when the participants in Johnsen's (2013) study had feelings of happiness, they identified with the natural environment photos. When intending to regulate sadness (become happier), they also identified with the the natural environment photo.

In considering the impacts varying levels of interaction had on people's cognitive, social, emotional, and behavioral states, it is important to consider how these impacts may differ between gifted and non-gifted students. Pfouts (2003) explores the idea of intentional interaction of gifted students with nature and its impact on the students. Pfouts (2003) identified that most gifted students have experienced the world mainly through text and have little opportunity to experience nature hands-on and minds-on. In the classroom, they are often only provided the opportunity to read and discuss topics they already know. Specifically, Pfouts states that "the ability to explore how and why things work or behave a certain way is foundational to the needs of gifted learners" (p. 57). Therefore, the opportunity for gifted students to engage hands-on, minds-on with nature "will [allow gifted students to] gradually understand the broader principles as they develop the cognitive skills to make more abstract generalizations" (Pfouts, p. 57). Pfouts (2003) implies that intentional interaction with nature is essential for cognitive development of gifted students.

It is also important to determine the appropriate age to involve children in nature and nature of science lessons. According to Allen (2013), elementary children between the ages of six to twelve are in the exploratory age of development and it would be natural and beneficial for children of this age group to collect rocks, shells, wild edibles, and explore streams, the ecosystem of creeks, and observe geological features. They should be afforded the opportunity to experience what John Muir stated: "When we try to pick out anything by itself, we find it is hitched to everything else in the universe." It is

understood that this age group has already bonded with nature through the early childhood years and has initiated “biophilia - an affinity for the living world” (Allen, 2013).

Gifted and Emotions

Although research on how emotions are impacted by interactions with nature was discussed, there is also appreciable research pertaining specifically to gifted children's emotions. Gifted children are complex, with asynchronous development, overexcitabilities, and higher intellectual cognitive functioning (NAGC, 2016; Mofield, 2015). Often gifted students will display or report evidence of perfectionism, depression, anxiety, and academic anxiety at a higher rate than their non-gifted peers (Mofield, 2015; Shechtman, 2012). Through analysis of these traits alongside their peers, and through analysis of emotional interaction with the environment (natural world), it is possible to begin to understand the emotional complexities of gifted students.

Perfectionism, depression, and anxiety.

There is a fair amount of research indicating that gifted students suffer from increased incidents of perfectionism, depression, and anxiety. *Socially prescribed perfectionism* (SPP) is when “an individual perceives other people hold exaggerated expectations of them” (LaMont, 2012) and affects gifted students emotionally. Gifted students that have a tendency for SPP also have a tendency for characteristics of depression (LaMont, 2012). According to Mofield

(2015), gifted students have a heightened sensitivity, intensity, and vulnerability to criticism, but also have an ability to mask emotional distress towards others. This strive for unrealistic goals leads students to perform out of fear of failure and results in feelings of never being good enough, thus leading to self-depreciation and depression (Mofield, 2015). Rice (2006), LaMont (2012), and Mofield (2015) identify that perfectionism may be linked to depression and anxiety in gifted students. Perfectionism can influence negative emotions and feelings of inferiority and inadequacy (Mofield, 2015).

Mofield (2015) explains that there is a debate relating to unhealthy and healthy perfectionism - it can have both negative and positive side effects. According to Mofield (2015), unhealthy perfectionism might manifest when a student "does not live up to the expectation of others, magnifies his mistakes over strengths, and relies on self-affirmation from others for validation of worth" (p. 412). Negative side effects may include low self-esteem, feelings of shame, anxiety, and depression (Mofield, 2015). Healthy perfectionism might manifest as "the individual desires to do his very best, motivated by a drive to fulfill one's potential, not to fulfill the expectations of others" (Mofield, 2015, p. 412). Positive side effects may include conscientiousness, order, and endurance (Mofield, 2015). Connecting to Dabrowski's overexcitability domains (Tolan, 1999), Mofield (2015) states that "perfectionism begins as a facet of emotional overexcitability and evolves into a drive for self-perfection" (p. 411). In this case, heightened overexcitabilities "allow persons to have the capability to reach the highest levels of personality development" (p.409). In contrast, imaginational overexcitability

may lead to unhealthy perfectionism as the concern for mistakes becomes magnified through the intensity of imagination (Mofield, 2015). Further, according to Rice (2006), gifted students are more acutely aware of their perfectionism.

Therefore, the intense awareness of expectations, or socially prescribed perfectionism, is relevant to gifted students as it pertains to the social environment (Mofield, 2015). Perfectionistic tendencies should not be eliminated, but rather positive aspects should be enhanced and negative aspects should be "channeled to propel one toward growth and development" (Mofield, 2015, p. 412). Lamont writes "Students who evidence this type of perfectionism (SPP) should be encouraged to be aware of their moods and to monitor their expectations" (p. 273).

Students have more responsibilities as the grades progress, which can perpetuate heightened sensitivities of exaggerated expectations or SPP. However, it may be difficult for students to monitor emotions, especially as the self identified level of stress increases as the gifted child progresses from elementary school to high school (Peterson, 2009). According to research conducted by Han (2009), feelings of pressure, stress, and anxiety can have negative impacts on cognitive focus. Students are required to sustain attention and perform academically, but an overload of information can cause distraction and shorten attention spans. Mental fatigue due to increased testing, lack of tranquility, and an overload of stimulants can "cause distraction and reduced performance, negative emotions such as irritability and tension, impulsiveness and hostility, or even aggression

and violence" (p.659). Further, mental fatigue can impede cognitive reasoning and the ability to react and interpret information (Han, 2009).

According to a study by Peterson (2009), gifted students identify academics (advanced coursework, academic testing, competition with peers) as the most stressful, challenging life events. Fimian (1986) conducted a study and identified that gifted students are stressed. In his study, 56% of the 121 gifted students (sample population) reported moderate to extreme stress. However, gifted students are not likely inclined to share the stressors they are processing; parents and other adults may be unaware of the internal stressors and pressures that academic achievement is placing on the gifted child (Peterson, 2009).

Although Fimian (1986) identified that gifted students have higher levels of stress, there is mixed evidence on the role that academic anxiety plays in gifted students. In one study, Goetz (2008) found that there is a reciprocal nature to anxiety and test performance, as worry competes with cognitive functions such as problem solving, short term memory, and attention. In another study, Peterson (2009) found that students who have high stress are able to maintain high achievement on tests. Contrary to Peterson's evidence, Goetz (2008) extrapolates that "test anxiety also produces certain aversive patterns of motivation, coping, and task strategies that interfere with learning and performance. Poor performance outcomes lead to further anxiety over time, generating a vicious circle of increasing anxiety and degrading performance" (p. 186).

The internal stressors that encompass academic anxiety include both cognitive and affective implications: Worry and Emotionality (Goetz, 2008). Worry encompasses more cognitive processing and concerns "the consequences of failure, whereas Emotionality is defined as consisting of perceptions of autonomic reactions evoked by evaluative stress" (p. 186). To restate this, Worry involves intrusive, self-evaluative thoughts and Emotionality involves nervousness, tension, and physiological reactions such as a racing heart or upset stomach (Elliot, 2007). Emotionality, therefore, is more externally observable with autonomous reactions (crying) (Goetz, 2008). When a gifted student is confronted with a demanding academic task, academic performance may be impaired as the Worry component of anxiety is taking up attention and working memory. As Goetz (2008) explains, knowledge about the effects of these cognitive and affective stressors can help educators mitigate anxiety through avoiding focus on test performance consequences and/or by establishing a learning environment that reduces evaluative stress.

Considering that Peterson (2009) identifies that stress on the gifted child increases with grade advancement, it is important to note the academic settings of gifted students. Goetz (2008), supports homogeneous classes (grouping based on similar levels of intelligence) for gifted students. Homogeneous grouping is necessary, especially when considering that gifted students in a heterogeneous (mixed setting) receive little or no differentiation and participate in whole group activities the majority of the time (Goetz, 2008). However, although homogenous grouping allows for more differentiation, it also

results in heightened test anxiety due to feelings of inadequacy and incompetence (Peterson, 2009). Similarly, Zeidner (1999) concluded that gifted students in a homogenous grouping have heightened levels of test anxiety compared to gifted students in a heterogeneous classroom. Goetz (2008) identifies that these feelings of academic anxiety are a reaction to the ability and performance of the homogenous peers.

Understanding the research regarding SPP (LaMont, 2012), mental fatigue (Han 2009), and heightened stress levels in gifted students (Fimian, 1986), Lamont states that the ability to manage emotions will lead to higher cognitive functioning, thus enabling students to validate and express true feelings as well as solve problems. One suggestion to reduce anxiety is to offer time to meditate and/or use relaxation techniques (Lamont, 2012). In order to reduce the levels of stress, especially as it pertains to school pressures and quality of life, Nguyen (2016) recommend an increase in recreation and leisure activities outside of the classroom.

Summary

The research regarding sensory implications for gifted children, how gifted children interact with the natural world, and gifted children's emotions is substantial. The research indicates that gifted students are different from their peers and that they have higher levels of stress. They have heightened sensitivities and overexcitabilities. Being identified as gifted can be a measurement in both academic and social capacities. Gifted students that are in a homogenous learning environment can have a more negative

academic self image that perpetuates anxiety, especially as it pertains to testing and measurement of academic achievement. Heightened anxiety levels during high stakes testing can impede academic achievement due to its effect on focus and processing speed. Heightened anxiety can also have a substantial impact on mental fatigue. Studies have indicated that interaction with the natural world leads to increased cognitive functioning and a reduction of stress.

I have found little research investigating if engagement in the natural world can reduce stress in gifted students. This study will aim to examine if there is a correlation between stress levels and interaction with nature in order to expand our understanding of gifted students. Through this understanding, we will be better informed on how engagement with the natural world could potentially mitigate anxiety. My research is to explore the question, “Can engagement in the natural environment reduce stress in gifted students?”

CHAPTER THREE

Research Methods

Overview

"Can engagement in the natural environment reduce stress in gifted students?" is the topic of my research. The purpose of this research was to determine if integrating the natural environment into the gifted classroom and bringing students into the natural world would reduce stress levels, or have a positive correlation on emotions.

Given the complex nature of gifted students as detailed in chapter two, it was imperative to conduct a study that did not induce additional stress, anxiety, or overexcitability. Therefore, data collection occurred in the natural educational setting, my classroom, which allowed me to be an active participant in delivering the lessons and administering the instruments of data collection. Because of my role in data collection, I was provided the flexibility to consider the whole child and the holistic problem (Creswell, 2014). I needed to be sure that my words or actions did not elicit stress, thereby clouding or contaminating the responses students provided in survey instruments. Rather, I needed to be certain the data collected was related to the experience of engaging with nature.

In this research project, I will be employing a mixed-methods research approach, where both quantitative and qualitative data are included in the study. Using both types of

data will permit further analysis of my research question on whether, and to what extent, student engagement in the natural world contributes to a reduction in stress levels in gifted students. The instruments used gathered qualitative data through open-ended questions that focused on the students' perceptions of the experiences, and quantitative data through Likert scales that focused on the pre- and post-anxiety levels.

Context

The participants in the study were my students. There were 23 fourth graders and 20 fifth graders who qualified for the Exceptionally Gifted Program. These students were in a mixed classroom and were between the ages of eight and eleven. Most students of this grade range are typically nine to eleven, but given the academic advancements of gifted students, there may have been a child that bypassed a lower level grade (grade acceleration) or may have had an early entrance into kindergarten. These students were chosen because they were part of the Exceptionally Gifted Program of our school district and were set to learn curriculum on environmental biology.

The qualification of the students accepted into the Exceptionally Gifted Program is to have a measured intelligence quotient (IQ) of 140 or higher on the Wechsler Intelligence Scale for Children Edition (fourth or fifth edition, a.k.a. WISC-IV or WISC-V). The IQ may be reported as full scale intelligence quotient (FSIQ) composite that is based on subtests that measured intellectual functioning in five cognitive areas: Verbal Comprehension Index (VCI), Visual Spatial Index (VSI), Fluid Reasoning Index

(FRI), Working Memory Index (WMI), and the Processing Speed Index (PSI) (Goudis, 2015). If any of these subtest indices resulted in outliers from the other subtest index scores, children may have been given ancillary tests that measured General Ability Index (GAI). If the FSIQ or the GAI measured at 140 or higher, they were invited to an hour and a half simulation of academic exercises that would have been typical of the program during a typical school day. After a committee evaluated the performance of the child during the simulation, and it was determined that placement in the gifted program would positively impact the child, he/she were then invited to the self contained gifted program and the mixed grade classroom. Self-contained, mixed-grade classrooms did not integrate with general education classrooms for academic instruction.

The demographics of the 43 Exceptionally Gifted Program students in grades four and five were 27 boys and 16 girls. Race demographics consisted of 39 classified as white, two classified as asian, and two classified as black. Although one or more students may have been a mixed race (such as Asian-Caucasian or Hispanic-Caucasian) the data relating to ethnicity was gathered through the school system and reported according to the federal race classifications. In the total school population, 8.2% were free and/or reduced lunch students and 2.5% were English Language Learners. However, none of the students in the sample were reported as free and/or reduced lunch nor were any reported as English Language Learners. There were six twice exceptional students; that means they were identified as gifted and another exceptionality, such as emotional-behavioral

disorder, attention deficit disorder, attention deficit hyperactivity disorder, or on the autism spectrum.

Setting

Located in an affluent older suburb on the edge of a large, diverse metropolitan area, the elementary school campus consisted of an older three level building and single story additions. Approximately half of the classrooms were in the single floor additions, and half of the classrooms were in the three-level building. The typical school classroom in the three-level building was relatively large in comparison to other classrooms in the single story additions.

The classrooms for the Exceptionally Gifted Program were slightly smaller than the traditional single-grade classrooms in the building. These classrooms were on the main floor of the three-level building. Both classrooms had windows on the east side, with parking lot views. Students received all academic instruction in these classrooms with the exception of special instruction: physical education, art education, music education, and media education. The 43 students had two teachers and two paraprofessionals who aided in reinforcement, organization, and instruction.

The settings for this study occurred in two different locations: the smaller of the two classrooms and a triangle-shaped pond across the street from the school. The pond area was shaped like an equilateral triangle, and each side of the area was approximately 350-400 feet in length. Encompassing approximately 1.3 acres, the wetland pond was

surrounded by mature trees, cattails, and tall grass. There was a duck's nest and shore access to the pond. Buckthorn had been removed in two phases around the pond, so clearer access was available on two sides of the pond area.

Methods and Tools

The research review has indicated that gifted students have sensitivities to senses, perceived heightened levels of stress, and limited exposure to the natural world. Given that my topic of research is "Can engagement in the natural environment reduce stress in gifted students," tools were needed to gather data. Therefore, I created two instruments (Appendix A and B). The first instrument (Appendix A) was used to gather baseline data from each student regarding perceived favorable and unfavorable senses, perceived levels of existing stress, perceived causes of any stress, activities that may promote relaxation, time spent outdoors, and activities done outdoors. Hereinafter, this instrument will be referred to as the Baseline Instrument.

In relation to the senses, recall that review of research studies has indicated that gifted students may have heightened sensitivities or overexcitabilities as it pertains to their senses, and manifested characteristics may be an outlet for internal tension (Lamont, 2012 and Mofield, 2015). Therefore, the questions on this instrument were designed to determine if a sense--such as smell or touch-- was auspicious (favorable and conducive to success in an experience) or adverse (unfavorable and unconducive to success in an experience). For instance, suppose a student is averse to having unclean hands. She may

report that she is averse to the sense of touch because she dislikes the feeling of something being on her fingers. This would be important to note if the engagement experience were to be exploring organisms in the earth. In this case, the experience with the natural world may not have been adverse, but rather an underlying "sense" characteristic of the student may have caused the aversion to the experience. Furthermore, suppose pine is an auspicious smell to a student. He may not be attributing any reduction of stress levels due to the engagement with the natural world that created that particular smell, but rather be focused on the favorable smell regardless of the experience.

Regarding perceived levels of stress, recall that Peterson (2009) noted that gifted students are not likely inclined to share the stressors they are processing. The quantitative tool to capture existing levels of perceived stress on the Baseline Instrument was a Likert scale. This scale was used to report frequency that emotions were felt by the student in the prior week. In some cases, it can be difficult for gifted students to explain what feelings define their experience. Therefore, I included a plethora of words that may tap into the word association for their feelings. Included choice words on the Likert scale were *stressed, nervous, anxious, afraid, worried, self-doubting* and *perfectionistic*.

Again connecting back to the review of research, recall that Johnsen (2013) identified that there was a positive correlation between interaction with nature and emotions. Similarly, Pfouts (2003) noted that gifted students need hands-on and minds-on interaction with nature. Students were asked to indicate engagement in the natural world

by recording how much time was spent outdoors on typical school day (excluding school scheduled recess time). The Baseline Instrument also had open-ended questions to provide qualitative data, thus providing for more complete understanding of the participant's experiences and views. In order to determine potential causation of identified emotions, students were able to respond to open-ended questions regarding their feelings. Likewise, students were able to respond to open-ended questions regarding activities that allow them to relax and activities they engage in outdoors.

The second instrument I created (Appendix B) was a tool to gather data after each experience. Hereinafter, this instrument will be referred to as the Post Experience Survey. It was used after three experiences in this research study. Similar to the Baseline Instrument, the tool gathered both quantitative and qualitative data to address the research question. Quantitative questions asked students to report on the senses used in the experience and the emotions felt during the experience. Also similar to the Baseline Instrument, the Post Experience Survey used a Likert scale as a method to determine frequency of emotions felt in the prior week. Similar choice words on the Likert scale were *stressed, nervous, anxious, afraid, worried, self-doubting*, and *perfectionistic*. In addition, another Likert scale was used to capture frequency of seemingly more positive emotions felt in the prior week. Choice words on this Likert scale were *happy, relaxed, hopeful, joy, peaceful, confident,* and *inquisitive*. The Likert scale pertaining to positive emotions was included on the Post Experience Survey because it could be used to determine if positive emotions increased after each experience. Since the Baseline

Instrument gathered data regarding how much time was spent outdoors on a typical school day, the Post Experience Survey gathered this data in the same manner. Furthermore, the Post Experience Survey also had open-ended questions to provide qualitative data. Students were able to respond to open-ended questions asking about their thoughts and feelings about the experience and what activities they engaged in outdoors. The purpose of these open-ended questions in the Post Experience Survey was to determine if there was an increase in outdoor activity during the course of the experiences, and if the outdoor activities changed because of the engagement in the natural world from the classroom experiences.

Now that the two tools to gather data have been explained, it is necessary to understand the duration of the experiences before addressing when each instrument was administered. An Environmental Biology unit occurred during the 2016-2017 school year, specifically during the months of April and May. The unit started April 5, after spring break and concluded May 25, before Memorial Day break. Most experiences were in the afternoon, from 1:30 - 2:30, to allow for favorable weather and temperature for the students to engage in activities outdoors. Throughout the environmental biology unit, students engaged in various activities and experiences including dissecting owl pellets, pond studies, and extraction of vegetables (barley, corn, and radishes) from indoor terrariums. Given that the fourth and fifth grade Exceptionally Gifted Program had two classes totaling 43 students, the instruction and experiences were over two days, with one

group (of 22 students) engaging in activities one day and the other group (of 21 students) engaging in the same activities the following day.

The Baseline Instrument was administered prior to any environmental biology experience on April 5 and April 6. The Post Experience Survey was administered three times, once after each experience. The first application of the Post Experience Survey was administered after an experience involving dissection of owl pellets in the classroom setting on May 2 and May 3. The second application of the Post Experience Survey was administered after an experience involving pond studies at the local pond setting on May 4 and May 5. Finally, the third application of the Post Experience Survey was administered after an experience involving extraction of vegetables from an indoor terrarium in the classroom setting on May 22 and May 23.

Data Analysis Methods

Creswell (2014) describes a *mixed method design* as one in which a researcher collects both quantitative and qualitative data and combines or integrates the data in a research study. More specifically, a "Convergent Parallel Mixed Method Design" (Creswell, p. 219) is a mixed method design where the researcher merges quantitative and qualitative data that used the same parallel variables to provide a more comprehensive analysis of the research study. The data analysis will use a *side-by side* method as "the researcher makes the comparison within a discussion, presenting one set of findings and then the other" (p. 222). A *side by side* method is a way to merge

databases by a) first reporting the quantitative statistical results and then b) addressing how the qualitative results confirm or disconfirm the quantitative results. The *side by side* method could also merge databases the other way around, by a) first discussing the qualitative results and then b) comparing them to the quantitative statistical results (Creswell, 2014).

In keeping with Creswell's Convergent Parallel Mixed Method Design inquiry approach and analyzing the data using the side by side method, the Baseline Instrument data was first analyzed to determine if there were any general themes, aversions, or favorable senses captured in the data that might be part of the sensory nature experiences. As almost all 43 students reported on the questions that pertained to the senses, the calculated percent of total allowed for themes to emerge regarding favorable and unfavorable senses. The Post Experience Surveys data related to the sensory experience was then compared next to the Baseline Instrument data regarding favorable and unfavorable senses to determine if the stimulation of the sense was attributed to the reduction of stress, or an increase in stress.

Next, considering that it was also important to understand and analyze what their starting levels of emotions were, the Baseline Instrument asked questions to obtain quantitative data. Students completed a Likert scale with the words *stressed, nervous, anxious, afraid, worried, self-doubting,* and *perfectionistic*. Any report in the category was tallied and a percentage of the total was calculated. In the Post Experience Surveys, a Likert scale with these words and seemingly more positive words of *happy, relaxed,*

hopeful, joy, peaceful, confident, and *inquisitive* were included to determine if positive emotions increased after each experience. Further analysis of this quantitative data from the Post Experience Surveys and the Baseline Instrument can confirm or disconfirm a reduction of declared negative feelings and increase in declared positive feelings in response to the specific experience.

Then, to determine if engagement in the natural environment reduced stress, it will be important to first analyze the Baseline Instrument and identify the frequency that students felt *stressed, nervous, anxious, fearful, worried, self-doubting,* or *perfectionistic*. Students were able to report frequency measured as *None (0/7 days), Some (2/7 days), Often (5/7 days)*, or *Daily (7/7 days).* For each category, the tallies and percentages were calculated. Then, using the same reporting method as in the Baseline Instrument in each of the Post Experience Surveys, each category was tallied and percentages were calculated. Comparing the frequencies from the Baseline Instrument to the Post Experience Surveys will allow for a further analysis of quantitative statistical data. Given that the Post Experience Surveys asked for frequency that students felt *happy, relaxed, hopeful, joy, peaceful, confident,* and *inquisitive* with the same frequency reporting method of *None, Some, Often,* and *Daily*, quantitative data could be analyzed regarding positive feelings over the course of the environmental unit and the three Post Experience Surveys. Additionally, it was important to understand what the students perceived to be the triggers of their stress at the start of the study. Analyzing the qualitative responses

from the Baseline Instrument will allow for any themes to emerge regarding perceived causation of the feelings.

Lastly, the Baseline Instrument asked how much time students spent outdoors and also asked an open-ended question regarding the activities they engaged in the outdoors. Similarly, each Post Experience Survey also asked these questions. Again, using a side by side method, these quantitative and qualitative questions can be analyzed from the Baseline Instrument and compared to each of the Post Experience Surveys to deduce if there is an increase in time spent outdoors and if the activities change in regard to indirect, incidental, or intentional contact.

Students responded anonymously each time the instruments were administered, and the collection of responses were labeled with the experience type, date, and time. Shortly after the conclusion of the environmental unit, the packets of responses were tallied and organized in a spreadsheet.

Summary

All 43 Exceptionally Gifted Program students experienced an integration of the natural world in the classroom as well as engagement with the natural world at a nearby wetland pond. The existing research indicates that internal tensions can be manifested through the senses (Lamont, 2012 and Mofield, 2015) and gifted students are not likely inclined to share the stressors they are processing (Peterson, 2009). Further, the review of research has also indicated that there was a positive correlation between interaction with

nature and emotions (Johnsen, 2013). Therefore, the instruments used in this research gathered qualitative data through open-ended questions that focused on the students' perceptions of the experiences, and quantitative data through Likert scales that focused on the pre- and post-anxiety levels.

The data from these instruments, the Baseline Instrument and the Post Experience Surveys, were analyzed using a Convergent Parallel Mixed Method Design. Specifically, a *side by side* approach was used to analyze my research question of "Can student engagement in the natural environment reduce stress in gifted students?" Now it can be examined if there is a correlation between stress levels and interactions with nature. Through examining the results of the data analysis, we will be better informed about whether engagement with the natural world mitigates stress.

CHAPTER FOUR

Results

Overview

"Can engagement in the natural environment reduce stress in gifted students?" is the topic of my research. Recall that the data was collected both qualitatively and quantitatively through open-ended questions and Likert scales, and the tools used were the Baseline Instrument and the Post Experience Survey. Data was gathered regarding the impact of sensory experiences on gifted students, the degree to which gifted students interacted with nature, and the complex nature of emotions in gifted children. There were 43 Exceptionally Gifted Program students in the study, although students may have been absent from the experience, or not in attendance when gathering data through the tools. The setting of experience and data collection was a classroom setting and the local pond, as discussed in chapter three. Utilizing a Convergent Parallel Mixed Method Design approach whereby data is analyzed on the *side by side* method, results were analyzed to determine if there is a correlation between stress level and interactions with nature.

Baseline Instrument

The Baseline Instrument was administered over two days, on April 5 and 6, 2017, and 42 students (one student was absent) in the Exceptionally Gifted Program responded

anonymously to the survey before the Environmental Biology curriculum was taught. Questions on this Baseline Instrument served to gather data from the students pertaining to their senses, time spent outdoors, activities done outdoors, existing levels of stress, causation of levels of stress, and activities that may promote relaxation.

Beginning with the sensory data obtained from the Baseline Instrument, 42 students completed the survey. Of the valid 39 responses, 64% of the students reported that sight was the most favorable sense, and 23% reported that touch was the most favorable sense (see Appendix C, Q1). Although all 42 students responded to the qualitative question on the Baseline Instrument asking why their chosen sense was the most favorable, one particular comment stood out amongst the others. This student responded by writing, “I love seeing the colors and how they flow through the world.” In regard to the most adverse sense, three students reported in the qualitative comments that they could not pick an adverse sense, or that they appreciated all their senses; therefore, these three comments are not reflected in the data, again providing 39 measurable data points. Of these 39 responses, 41% of students reported that smell was the most adverse sense, while 33% reported that taste was the most adverse sense. Therefore, given the population of the study and the data reported, 87% reported that sight or touch was the most favorable sense, and 74% reported that smell or taste was the most adverse sense (see Appendix C, Q2).

The Baseline Instrument also contained quantitative and qualitative questions regarding the students’ engagement with nature. Quantitative data was obtained through a

scale, and qualitative data was obtained through an open-ended question. Again, although there are 43 students in the population being surveyed, 42 were in attendance on the day of the survey. One student responded by circling in between the choices on the scale; therefore, 41 responses are reflected in the percentages (see Appendix C, Q7). Regarding how much time the student spent outdoors on a typical school day (excluding recess), 5% of the students reported spending 0 minutes outdoors, 41% of the respondents reported 1-30 minutes outdoors, 24% reported 31-60 minutes outdoors, and 29% reported spending over 60 minutes outdoors. In response to the open-ended qualitative question regarding what activities they typically do outdoors, the majority wrote about sports such as basketball and baseball, while a few others responded with activities like playing tag, walking their dog, and reading.

Understanding that the Baseline Instrument was designed to also capture perceived levels of stress and varying emotions, and noting that in some cases, gifted students can have difficulty describing feelings for their experiences, a plethora of words were included on the Likert scale to choose from: *stressed, nervous, anxious, afraid, worried, self-doubting,* and *perfectionistic*. All 42 students in attendance responded to as many words as applicable to describe their emotions. Therefore, when analyzing the following chart, it is important to note that although there are more than 42 responses, there are 42 students responding. Given this, 57% of students reported feeling of *stress*, 48% reported feeling *self-doubt*, and 45% reported feeling *nervous*. Data also of note is that 38% of students have the feeling of being *perfectionistic*. The lowest frequency of

response was the category *afraid* with only 26% of students identifying with this emotion.

Q3	**In the past week, have you felt any of the following? (Circle all that apply)**		
Stressed	24	57%	
Nervous	19	45%	
Anxious	17	40%	
Afraid	11	26%	
Worried	18	43%	
Self-Doubting	20	48%	
Perfectionistic	16	38%	
Note: 42 Students responded to the question, but could identify more than one choice, if applicable.			

Students also responded to the quantitative question regarding the frequency of emotions felt (see Appendix C, Q4). There are numerous students who felt *stressed* (7%), *anxious* (12%), *self-doubting* (10%), or *perfectionistic* (10%) on a daily basis, defined as 7/7 days. The Baseline Instrument also captured the frequency of these emotions in the category *often* (5/7 days), and students reported that they felt *stressed* (17%), *nervous* (12%), *anxious* (17%), *afraid* (14%), *worried* (12%), *self-doubting* (21%), and *perfectionistic* (12%). Therefore, 24% of students felt *stressed*, 29% of students felt *anxious*, and 31% of students felt *self-doubting* on an *often* or *daily* basis. In relation to the qualitative question on what may be the causation of the stress, 36% of students responded with homework or school related topics. The majority of students identified

that reading, drawing, listening to music, and watching TV were ways in which they could relax.

The Baseline Instrument provided foundational data on how gifted students in this study felt about sensory input, what level of engagement students had with nature, what emotions they felt, and to what frequency they felt these emotions. The sense of sight or touch was the most favorable to 87% of the students in the study, 46% of students spent 30 minutes or less outdoors on a typical day, 19% of students felt *stressed* or *anxious* on a *daily* basis. Considering these benchmark data points, and the *side by side* approach to the Convergent Parallel Mixed Method Design, analysis of qualitative and quantitative questions on each Post Experience Survey can be compared back to the qualitative and quantitative questions on the Baseline Instrument to help answer the research question of "Can engagement in the natural environment reduce stress in gifted students?

Post Experience Survey: I Owl Pellets

Through the Environmental Biology curriculum, students learned about autotrophs (organisms that can produce their own food) and heterotrophs (organisms that obtain food from other organisms) and traced food webs in various habitats. As a hands-on, minds-on experience, students dissected owl pellets in the classroom setting to discover what these birds of prey consume from the ecosystem. Part of the dissection process involved students pulling apart the pellet with tweezers, washing debris with water, and assembling the skeleton of digested organisms to decode what animal the owl

consumed. The hour long duration of the owl pellet dissection occurred in the afternoon on May 2 and 3, 2017, and the Post Experience Survey: I Owl Pellets was conducted after clean up.

The Post Experience Survey captured quantitative and qualitative data regarding the sense utilized during the experience, engagement with nature and emotions felt during the experience as well as emotions felt during the past week. There were 40 students who completed the Post Experience Survey anonymously, and in regard to the quantitative question about which sense was used during the experience, 75% of students reported that they experienced the sense of sight, and 72.5% of students reported that they experienced the sense of touch (see Appendix D, Q1). One particular student commented on the experience by writing, “through the tweezers, I could feel the bones.”

Using the *side by side* analysis method, and comparing this sensory data back to the Baseline Instrument where 87% of the study population reported that sight or touch was the most auspicious sense, the experience of dissecting owl pellets could be viewed as a favorable sensory experience. In fact, a qualitative comment written was, “It was the most fun science project all year!” Another student wrote, “It was awesome and relaxing,” while another student wrote, “I was nervous at first, but then it was kinda fun.” Contrarily, one student wrote, “I think it was the hardest experience for me,” while another student wrote, “Ummm...people are cruel to want to dig through the bones of tiny, cute, helpless animals.” These comments are supported by the quantitative Likert scale question about emotions felt by the students during the experience. Analysis of the

responses to this question show that 45% of students reported feeling *stressed*, and 30% of students felt *anxious*. Alternatively, 40% of students reported feeling *happy,* and 42.5% reported feeling *confident* (see Appendix D, Q2).

Recall that Baseline Instrument obtained data regarding the duration of time spent outdoors during a typical school day (excluding recess). The Baseline Instrument captured that 46% of students spend 30 minutes or less outdoors (see Appendix C, Q7), while the Post Experience Survey: I Owl Pellets data shows that now 40% of students are spending 30 minutes or less outdoors. Since the percentage decreased, it is valid to state that there are more students spending more time outdoors.

Q6	**How much time have you spent outdoors on a typical school day this week (excluding recess time)?**		
0 Minutes	1	2.50%	
1-30 Minutes	15	37.50%	
31-60 Minutes	11	27.50%	
60+ Minutes	13	32.50%	
Total	**40**	**100.00%**	

Comments about what activities students are engaging in outdoors were similar to the Baseline Instrument data: walking, basketball, soccer, playing with my dog, and jumping on the trampoline, just to name a few.

Just like the Baseline Instrument, the Post Experience Survey was designed to capture perceived levels of stress and varying emotions. The same plethora of words were included on the Likert scale (*stressed, nervous, anxious, afraid, worried, self-doubting,*

and *perfectionistic*). The categories of frequency in which the Likert scale was designed was the exact same as the Baseline Instrument. Recall that 29% of students reported feeling *anxious*, 24% of students reported feeling *stressed*, and 31% of students reported feelings of *self-doubting* on an *often* (5/7 days) or *daily* (7/7 days) basis on the Baseline Instrument data (see Appendix C, Q4). Now, given the duration of time between April 5 and 6 when the Baseline Instrument was administered and the Post Experience Survey: I Owl Pellets, data shows that there is a decrease in the percentage of students reported feeling *anxious, self doubting,* and *afraid* on a *daily* or *often* basis. Feelings of *anxiety* decreased 9% to 20% of students feeling this emotion, while *self-doubting* feelings decreased 4% to 28% of students feeling this emotion. That said, *stressed* feelings have increased from the Baseline Instrument data of 24% of students feeling *stressed* (see Appendix C, Q4) to 48% of students feeling *stressed* during the week of the owl pellet experience.

Q4	**In the past week, how often have you felt the following?**								
	Frequency Data					***Percentage of Frequency***			
	None	Some	Often	Daily		None	Some	Often	Daily
Stressed	7	14	17	2		18%	35%	43%	5%
Nervous	16	16	6	2		40%	40%	15%	5%
Anxious	17	15	6	2		43%	38%	15%	5%
Afraid	27	9	3	1		68%	23%	8%	3%
Worried	15	14	5	4		38%	35%	13%	10%
Self-Doubting	19	10	9	2		48%	25%	23%	5%
Perfectionistic	16	13	6	5		40%	33%	15%	13%
Note: 42 Students responded to the question.									

A second Likert scale was included to capture any positive emotions felt in the prior week. These words in this Likert scale were *happy, relaxed, hopeful, joy, peaceful, confident,* and *inquisitive*. All 40 students in attendance responded to as many words as applicable to describe their emotions (see Appendix D, Q5), and 80% of students reported feeling *happy* on a *daily* or *often* basis--45% of students reported feeling *happy* on a *daily* basis.

A *side by side* approach to the Convergent Parallel Mixed Method Design affirms that students preferred sight or touch to other senses, increased their time outdoors, and experienced a decrease in feelings of *anxiousness* and *self-doubt*. However, there is an increase in reported stress levels. Analyzing and comparing the next two Post Experience Surveys back to the Baseline Instrument and the Post Experience Survey: I Owl Pellets, I will continue to pursue answers to the question of "Can engagement in the natural environment reduce stress in gifted students?"

Post Experience Survey: II Pond Studies

On May 4 and 5, 2017, students engaged in a field pond study. As described in chapter three, the pond was a short walking distance from the school, and was in an enclosed area with pond access as well as a tree buffer. After learning about aquatic species and the tolerant and intolerant organisms that make up the pond ecosystem, students were assigned a task to inspect the pond water for evidence of a healthy ecosystem. In addition, students were assigned to capture insects using nets in the tall

grasses that surrounded the pond. Teams of students were equipped with buckets, ice cube trays, rulers, spoons, tweezers, petri dishes, magnifying lenses, nature journals (to record data), and nets. The class shared a large white tarp to empty any organisms captured in the nets, as the white background contrasted against the darker colored insects. As students found organisms from the pond water, they placed them in the ice cube trays, detailed color and size, and compared them to classroom notes on organisms' tolerance of water quality conditions. Evidence of intolerant species would indicate a healthier ecosystem, whereas evidence of only tolerant species may indicate an unhealthy ecosystem. When the class was finished and back in the classroom, the students completed the Post Experience Survey: II Pond Studies.

There were 39 students who completed the Post Experience Survey for the pond study. In regard to the quantitative question about which sense was used during the experience, 95% of students reported that they experienced the sense of sight, and 41% of students reported that they experienced the sense of touch (see Appendix E, Q1). One student identified using all senses, and commented that "we interacted with macro invertebrates." Although 41% of students from the Baseline Instrument identified smell as the most adverse sense (see Appendix C, Q2), 18% of students quantitatively identified with smell as a sense they experienced, and numerous other students qualitatively commented that they smelled the water and the pond organisms, which may be a factor in the emotions reported from the pond studies experience.

Despite an increase of students' reports of using the sense of smell, and that it was determined an adverse sense for this population of this study, approximately 26% of students reported feeling *stressed* on the Post Experience Survey: II Pond Studies (see Appendix E, Q2). Analysis of this data calculates to be almost a 20% reduction in reported feelings of stress from the Post Experience Survey: I Owl Pellets. 20.5% of students reported feelings of anxiousness, which was almost a 10% decrease from the previous survey. On questions about positive emotions, approximately 69% of students reported emotions of feeling *happy*, and about 41% felt *relaxed* as reported and detailed in Appendix E, Q2. However, there was a reduction in student reports of *confidence*, with approximately 28% of students reported feeling confident in the pond study survey compared to 42.5% after the owl pellet survey. Qualitative data from student comments also support positive moods. One student wrote, "It was fun to investigate creatures and test water from a pond near us instead of a random pond we don't use," while another commented, "I like how we get to spend time outside to see all these cool creatures and get to study them."

Student engagement outdoors has also increased, as measured by students reports of spending over 60 minutes outdoors on a typical school day. The Baseline data (Appendix C, Q7), documented 29% of students engaging in this time outdoors. The Post Experience Survey: I Owl Pellets (Appendix D, Q6) documented 32.5% of students engaging in over 60 minutes outdoors, and the Post Experience Survey: II Pond Studies documented over 41% of students spending this time outdoors.

Q6	How much time have you spent outdoors on a typical school day this week (excluding recess time)?		
0 Minutes	1	2.56%	
1-30 Minutes	13	33.33%	
31-60 Minutes	9	23.08%	
60+ Minutes	16	41.03%	
Total	**39**	**100.00%**	

Qualitative comments were similar to those stated previously, but now a few students commented on simply playing in the yard, climbing trees, and exploring the woods.

The data shows that students felt less stressed during the pond studies versus the owl pellet experience, and that they spent more time outdoors, but how are their reported stress levels over the last week? First, comparing the Post Experience Survey: II Pond Studies to the Post Experience Survey: I Owl Pellets, reported data exhibits that feelings of anxiety increased 8%, from 20% of students feeling *anxious* during the week of the owl pellet experience to 28% of students feeling *anxious* during the pond studies. Data also shows an increase in reports of feeling stressed with 45% of students reported feeling stressed during the owl pellet experience to 49% of students feeling this emotion during the pond studies. The data shows that feelings of *self-doubt* remained the same between these two experiences over those time periods. Since the data from the Post Experience Survey: I Owl Pellets has already been compared to the Baseline Instrument Survey, and it has been stated that stress reports increased, it is tacit that stress reports have increased over the Baseline Instrument data.

Q4	**In the past week, how often have you felt the following?**								
	Frequency Data					***Percentage of Frequency***			
	None	Some	Often	Daily		None	Some	Often	Daily
Stressed	10	10	14	5		26%	26%	36%	13%
Nervous	13	16	7	2		33%	41%	18%	5%
Anxious	18	10	7	4		46%	26%	18%	10%
Afraid	21	11	5	1		54%	28%	13%	3%
Worried	13	15	5	4		33%	38%	13%	10%
Self-Doubting	16	12	5	6		41%	31%	13%	15%
Perfectionistic	20	7	4	8		51%	18%	10%	21%
Note: 39 students responded to the question.									

Just as with the Post Experience Survey: I Owl Pellets, a second Likert scale was analyzed to capture seemingly more positive emotions felt in the prior week. All 39 students in attendance responded to as many words as applicable to describe their emotions (see Appendix E, Q5), and 82% of students reported feeling *happy* on a *daily* or *often* basis. 54% of students reported feeling *happy* on a *daily* basis--this is a 9% increase from the previous survey.

Thus far, students are spending more time outdoors and are reporting increased feelings of happiness, but feelings of anxiety are increasing. Now data from the last classroom experience are analyzed to determine if there are correlational trends in the data.

Post Experience Survey: III Indoor Terrariums

At the beginning of the Environmental Biology curriculum unit, students planted (in small groups) seeds of barley, corn, peas, and radish in indoor terrariums. The groups were able to determine the number of seeds planted, the location of where seeds were planted in the terrarium, the amount of water given to the seeds, and the classroom placement of the terrarium. As the seedlings grew, students documented soil conditions, plant height, and overall tolerance and adaptability of the plants. At the end of the unit, on May 22 and 23, the students carefully extracted the plants from the terrarium to document the root length and the plant height to compare back to their hypothesis on tolerance and adaptability. After the class finished their science observation and data collection worksheets, 41 students completed the Post Experience Survey: III Indoor Terrariums.

Parallel to the previous two surveys, the Post Experience Survey: III Indoor Terrariums captured quantitative and qualitative data regarding the sense(s) utilized during the experience, engagement with nature and emotions felt during the experience, as well as emotions felt during the past week. Regarding the quantitative question about which sense was used during the experience, 76% of students reported that they experienced the sense of sight, and 68% of students reported that they experienced the

sense of touch (see Appendix F, Q1). One student responded to the qualitative portion of this question by writing, "I saw the different root systems and leaves." Although 41% of students from the Baseline Instrument identified smell as the most adverse sense (see Appendix C, Q2), 22% of students quantitatively identified with smell as a sense they used during this experience.

Similar to the data from the Post Experience Survey: II Pond Studies, there was an increase of students' reporting using the sense of smell. Recall from the Baseline Instrument data that smell was determined to be an adverse sense for the population of this study. However, only about 15% of students reported feeling *stressed* during the activity on the Post Experience Survey: III Indoor Terrariums (see Appendix F, Q2). Analysis of this data calculates to be almost a 30% reduction in reported *stressed* feelings from the Post Experience Survey: I Owl Pellets, and approximately a 11% reduction in reported feelings of stress from the Post Experience Survey: II Pond Studies, as it relates to each experience.

A similar trend was seen in the data in regard to students' reports of feeling *anxious*. The Post Experience Survey: I Owl Pellets data showed a 30% report of student anxiousness, the Post Experience Survey: II Pond Studies data showed 20.5% of students reported feelings of anxiousness, and the last survey, the Post Experience Survey: III Indoor Terrariums data, reported less than 10% of students feeling anxious.

Analysis of the seemingly more positive feelings from the survey show that approximately 44% of students felt *happy* and about 56% felt *relaxed* during the

experience as reported and detailed in Appendix F, Q2. Comparing back to the previous two experiences, reported emotions of *happy* and *relaxed* has increased since the first indoor experience, but decreased from the outdoor pond study. Student reports of *confidence* increased 4% from the pond studies survey. Qualitative data from one student's comments also support these *happy* yet lacking *confidence* moods: "I was just really happy throughout the experiment, but I was worried that we had several badly growing plants when other groups had tall, nicely growing plants."

Student engagement outdoors has also increased from the Baseline Instrument data (see Appendix C, Q7). The Post Experience Survey: III Indoor Terrariums data exhibits that 31% of students are spending 30 minutes or less outdoors whereas the Baseline Instrument data showed that 46% of students were spending the same amount of time outdoors.

Q6	**How much time have you spent outdoors on a typical school day this week (excluding recess time)?**		
0 Minutes	0	0.00%	
1-30 Minutes	13	31.71%	
31-60 Minutes	12	29.27%	
60+ Minutes	16	39.02%	
Total	**41**	**100.00%**	

Negative emotions of *anxiousness*, *fright*, and *self-doubting* have trended downward from the Baseline Instrument and the two indoor experiences: Post Experience Survey: II Pond Studies and Post Experience Survey: III Indoor Terrariums. The data

shows a reduction of anxiousness on a *daily* or *often* basis from 29% to 28% to finally 25%. Feelings of being *afraid* have also reduced from these three data comparisons of 14% to 16% and now 7%. *Self-doubt* reports from students also reduced from 31% to 28% to 22%, all measured on the same frequency of *often* (5 out of 7 days) or *daily* (7 out of 7 days). Positive emotions were also captured, and of the 41 student responses, where students responded to as many words as applicable to describe their emotions (see Appendix F, Q5), 86% of students reported feeling happy on a *daily* or *often* basis.

Summary

Data from the Baseline Instrument and each Post Experience Survey have been analyzed using a Convergent Parallel Mixed Method Design (Creswell, 2014), whereby qualitative data has been compared on a *side by side* basis with analogous quantitative data to determine if engagement in the natural world can reduce stress in gifted students. Analysis of data focused on whether or not students would increase engagement in outdoor activities on a typical school day, and if engagement with the natural world could reduce stress in gifted students.

Students reported an increase in time spent outdoors over the course of the study. On April 5 and April 6, when the Baseline Instrument was administered, there was a smaller percentage of students spending time outdoors compared to the Post Experience Surveys. Although it is a slight increase, certainly more time was spent outdoors at the end of the study than at the beginning.

How much time do you spend outdoors on a typical school day (excluding recess time)?				
	Baseline Instrument	**Post Experience Survey: I Owl Pellets**	**Post Experience Survey: II Pond Studies**	**Post Experience Survey: III Indoor Terrariums**
0 Minutes	4.9%	2.5%	2.6%	0.0%
1-30 Minutes	41.5%	37.5%	33.3%	31.7%
31-60 Minutes	24.4%	27.5%	23.1%	29.3%
60+ Minutes	29.3%	32.5%	41.0%	39.0%
	41 Students	*40 Students*	*39 Students*	*41 Students*

Regarding gifted emotions, the data captured from all experiences aligned with the baseline data shows that over the course of this study, students have reported decreased feelings of *stress, nervousness, anxiousness, fear, worry, self-doubting* and *perfectionism*. In all categories, the seemingly negative emotions have decreased over the study. Feelings of *anxiousness* fell approximately 10% between each tool administered. Also, focusing on stress, 57% of students reported feeling stressed during the week of April 5. Comparing this data to the final Post Experience Survey: III Indoor Terrariums, where only 15% of students reported feeling stressed during the week of May 22, that calculates to be almost a 75% reduction of stress reported in students.

In the past week, have you felt any of the following? (Circle all that apply)				
	Baseline Instrument	**Post Experience Survey: I Owl Pellets**	**Post Experience Survey: II Pond Studies**	**Post Experience Survey: III Indoor Terrariums**
Stressed	57%	45%	26%	15%
Nervous	45%	23%	18%	12%
Anxious	40%	30%	21%	10%
Afraid	26%	10%	10%	2%
Worried	43%	23%	18%	12%
Self-Doubting	48%	13%	18%	10%
Perfectionistic	38%	18%	13%	20%
	Total of 42 students responding.	*Total of 40 students responding.*	*Total of 39 students responding.*	*Total of 41 students responding.*

However, when analyzing the frequency of these emotions as reported by the gifted students in this study on an *often* or *daily* basis, the data is somewhat contradictory. Students reported (as noted in the previous paragraph) a 75% reduction of stress levels over each instrument administered as well as a decrease in *frequency* of feeling anxious on a daily basis. At the same time, however, they reported (through a different prompt) a 40% increase in frequency of feeling stressed. In analysis of the frequency of reported feelings of *stress* during the week of each tool administered, there is a reduction of *daily* stress after the owl pellet experience, then an increase of daily stress after the pond studies experience, and back to a reduction of stress after the indoor terrarium experience. Therefore, the data specifically revolving around reduction of stress due to engagement with the natural world is not as convincing.

In the past week, how often have you felt the following?												
	Percentage of Frequency											
	Baseline Instrument			**Post Experience Survey: I Owl Pellets**			**Post Experience Survey: II Pond Studies**			**Post Experience Survey: III Indoor Terrariums**		
	Often	*Daily*	*Total*	*Often*	*Daily*	*Total*	*Often*	*Daily*	*Total*	*Often*	*Daily*	*Total*
Stressed	17%	7%	24%	43%	5%	48%	36%	13%	49%	27%	7%	34%
Nervous	12%	0%	12%	15%	5%	20%	18%	5%	23%	15%	5%	20%
Anxious	17%	12%	29%	15%	5%	20%	18%	10%	28%	20%	5%	24%
Afraid	14%	0%	14%	8%	3%	10%	13%	3%	15%	5%	2%	7%
Worried	12%	2%	14%	13%	10%	23%	13%	10%	23%	15%	5%	20%
Self-Doubting	21%	10%	31%	23%	5%	28%	13%	15%	28%	10%	12%	22%
Perfectionistic	12%	10%	21%	15%	13%	28%	10%	21%	31%	7%	15%	22%
	42 Students Responded.			*42 Students Responded.*			*39 Students Responded.*			*41 Students Responded.*		

Data analysis should also consider the seemingly more positive emotions that were captured after each experience engaging with the natural world. The following data indicates that the total frequency of emotions on an *often* or *daily* basis increased over the course of the three experiences. Specifically, the gifted students reported a steady increase of frequency of the emotions of *happy* and *relaxed* on an *often* or *daily* basis. Analyzing reports of frequency of feelings on a *daily* basis from the students indicates that over the course of these experiences, there has been a consistent increase in these categories of emotions: *relaxed, hopeful, joy,* and *peaceful*. Consideration of this data could imply that engagement in the natural world increased positive moods.

	Percentage of Frequency									
	Post Experience Survey: I Owl Pellets			**Post Experience Survey: II Pond Studies**			**Post Experience Survey: III Indoor Terrariums**			
	Often	*Daily*	*Total*	*Often*	*Daily*	*Total*	*Often*	*Daily*	*Total*	
Happy	35%	45%	80%	28%	54%	82%	37%	49%	85%	
Relaxed	35%	30%	65%	31%	36%	67%	29%	39%	68%	
Hopeful	33%	15%	48%	33%	28%	62%	24%	32%	56%	
Joy	35%	18%	53%	33%	36%	69%	32%	37%	68%	
Peaceful	28%	28%	55%	23%	31%	54%	32%	34%	66%	
Confident	40%	25%	65%	28%	44%	72%	39%	32%	71%	
Inquisitive	25%	28%	53%	33%	28%	62%	37%	24%	61%	
	42 Students Responded.			*39 Students Responded.*			*41 Students Responded.*			

The data from these instruments were analyzed using a Convergent Parallel Mixed Method Design --specifically, a *side by side* approach -- to answer my research question of "Can student engagement in the natural environment reduce stress in gifted students?" Through examination, the data indicates a positive correlation between reduction of stress levels and engagement with the natural world. Students reported increased time spent outdoors, a significant decrease in identifying with the emotion of *stress* and *anxiousness*, and an increase in positive feelings of happiness and relaxation. Now that the research question has been answered, it is important to also consider any limitations and future implications of the study.

CHAPTER FIVE

Conclusion

My research question, "Can engagement in the natural environment reduce stress in gifted students?" stemmed from my own difficulties coping with stress and anxiety as a young gifted child. My reprieve from peer scrutiny was interaction with nature and finding comfort in the intricacies of the natural world. As an educator with a Gifted and Talented Certificate, I wanted to not only teach academic extensions, but also empower gifted students with coping mechanisms to reduce stress and anxiety. I believed that integrating the natural world into students' studies would have positive effects on stress reduction, based on my own childhood experiences and the experiences I witnessed in my classroom. Guided by the research findings, instruments were designed to capture data that would seek to answer the research question. Even though the data from this study supports the hypothesis that interaction with nature reduces stress levels, it is also important to analyze how this study connects to previous research. Additionally, limitations and implications of this research need to be considered in order to plan for communication of results and future research in this area.

The review of literature provided insights on how to approach elements of the research question, such as how gifted students process the senses, the definitions of the natural world and engagement, and the intricacies of gifted emotions. First, Dabrowski's

work, whereby he identified five areas of intensities called "overexcitabilities," was important to this study. These overexcitabilities, which indicate a heightened ability to respond to sensory stimuli, helped me understand how gifted students process information through the senses. The five overexcitabilities of *psychomotor*, *sensual*, *intellectual*, *imaginational,* and *emotional* (Tolan, 1999) have a role in how gifted students interact with the world. Knowledge of these intensities enabled me to understand any perceived sensory bias from students as they engaged with the activities in the study. The instruments in the study captured sensory data on both a quantitative and qualitative level and permitted analysis of adverse and auspicious senses through each experience.

Also important to the study was the research on the definitions of nature and engagement with the natural world. Malone identified that humans are part of the natural world, that because we are interdependent with all the elements of nature we therefore intra-act with these elements (Malone, 2016). Through Malone's definition of the natural world, experiences such as owl pellets, pond studies, and indoor terrariums permitted students to intra-act with nature. Further, Stevenson (2014) and Keniger's (2013) research concluded there are three types of interaction with nature: indirect, incidental, and intentional. Knowledge of these forms of interaction impacted this study, as their work supported the claim that the varying levels of intra-action with nature had positive effects on students. Because Keniger's (2013) research showing that stress was reduced through intentional interaction with nature, the activities in this study were designed for intentional student interaction rather than simply direct or incidental interaction.

Additionally, the research of Pfouts (2003) specifically explored the idea of intentional interaction of gifted students with nature and its impact on the students. Pfouts stated that "the ability to explore how and why things work or behave a certain way is foundational to the needs of gifted learners" (p. 57). Therefore, the opportunity for gifted students to engage hands-on, minds-on with nature was a factor in this study. The experiences allowed for students to use their senses to intentionally engage with the activities through a hands-on, minds-on approach.

Elements of the literature review pertaining to emotions also impacted this study. First, Mofield (2015) stated that gifted students not only have a heightened sensitivity and intensity and vulnerability to criticism, but they also have an ability to mask emotional distress towards others. This research was elemental in the design of the instrument tools, as anonymity may have possibly permitted students to answer the surveys regarding their emotions more candidly. Second, regarding stress and anxiety, Goetz (2008) extrapolated that "test anxiety also produces certain aversive patterns of motivation, coping, and task strategies that interfere with learning and performance." This relationship between academic anxiety and production of adverse patterns of coping helped fuel the motivation to determine if engagement with the natural world could counter levels of stress and anxiety, which was foundational in the Post Experience Surveys. Finally, the research of Han (2009) and the effects that interaction with the natural world had on emotions was also supported by this study. Han (2009) found that, through interaction with the natural world, emotions were more positive, attention was perceived to have increased, and

mental fatigue was reduced. This study also concluded that emotions were more positive after interactions with nature.

Even though the study supported the hypothesis that engagement with the natural world can reduce stress in gifted students, there were limitations to the study. Reflection on the methodology and design as well as the study results unfolded limitations regarding the instruments, the settings, the time, and, moreover, the role that complex emotions of the gifted students played into the experiences and survey responses.

The Baseline Instrument captured data on favorable and unfavorable senses, but it did not specifically refer to the language Dabrowksi (Mofield, 2015) referred to on overexcitabilities. Neither the Baseline Instrument or the Post Experience Survey included questions surveying student perceptions of any intensities that may have been calmed or, alternatively, fed, through these experiences. Dabrowksi identified five overexcitabilities (Tolan, 1999), but the tools designed focused quantitative and qualitative questions pertaining to the *sensual* and *emotional overexcitabilities.* Both the Baseline Instrument and the Post Experience Survey should have also gathered information pertaining to the other three overexcitabilities to better understand how these sensory experiences may have been processed by the students.

Another limitation related to the tools was the nonparallel questions. The Baseline Instrument included a quantitative question regarding negative feelings and a qualitative question regarding causation of negative feelings, but the Post Experience Survey only included a quantitative question regarding the negative feelings. The Post Experience

Survey should have also included a qualitative question to capture the students' perceptions on the causation of negative feelings. In addition to this discrepancy between the tools, the Post Experience Survey included both negative and seemingly more positive emotions in the quantitative question about students' emotions, but the Baseline Instrument only had the negative emotions listed as an option. Both instruments should have also included a qualitative question probing for students' perceptions on causation of positive emotions.

Duration of time and activities spent outdoors was asked both quantitatively and qualitatively on both instruments, but that was the extent to which these tools probed about outdoor activities. From the review of research, Peterson (2009) indicated that adults may not be aware of stressors and pressures that academic achievement is placed on a gifted child, and the questions pertaining to time and activities specifically stated "on a typical school day" (Appendix A and B). Considering this, students may have been engaged in other activities that limited their time outdoors. Therefore, I should have included a question to address any activities that students may have been doing *instead* of being outdoors. The review of research by Stevenson (2014) and Keniger (2013) concluded that there are three ways to interact with nature: indirect, incidental, and intentional. The tools should have been designed to include a quantitative question regarding the type of activity students engaged in outdoors to parallel the qualitative open question asking what activities they did outdoors.

The very nature of the format and administration of the tools could have been another limitation. Given that I was the administrator of the surveys and also their teacher, who was formatively and summatively assessing the students on their understanding and synthesis of the lessons delivered during the environmental biology unit, my role could have consciously or unconsciously impacted their responses. According to Mofield (2015), gifted students have a heightened sensitivity, intensity and vulnerability to criticism, as well as the ability to mask emotional distress. Students could have been vulnerable to the paper and pencil format of the tools, and sensitive to the fact that their teacher received their responses.

Setting was also a limitation, as two experiences were conducted in the classroom setting, and one experience was at the local pond setting. Although the *side by side* analysis of the data compared levels of emotion through each experience, the outdoor experience did not have equal data to those of the indoor experiences. Students did engage in more outdoor activities than what was surveyed, and in hindsight, students should have been permitted to also respond to the quantitative and qualitative questions after these experiences as well. In short, more data should have been captured throughout the course of the unit to balance out the number of surveys administered after outdoor and indoor settings.

The research concluded that students' reports of frequency of *stress* and *anxiousness* on a daily basis increased the week of the pond study (Appendix E, Q4). Had the Post Experience Survey included questions mentioned above, analysis could have

been conducted to determine if the setting influenced students' stress levels. Despite this data, inferences can be made regarding the causation of stress and anxiety as it relates to the nature of this pond study experience.

During the pond study, students were to find organisms in the tall grasses and pond water to determine if it was a healthy ecosystem. The pond experience essentially required students to find evidence of aquatic species in order to complete the water quality tolerance study. LaMont's (2012) research, where *socially prescribed perfectionism* was identified as a perception of exaggerated expectations, may have contributed to the heightened reports of stress and anxiety. When analysis was expanded to include other words to describe their feelings during this time period, reports of *self-doubting* and perfectionism also increased. Mofield (2015) had stated that negative side effects to perfectionism could include low self-esteem and anxiety.

Another inference can be made relating to the senses reportedly used during this study. Smell was reported as the least favorable sense in the Baseline Instrument data (Appendix C), and 18% of students quantitatively identified with smell as a sense they experienced during the pond study (Appendix E, Q1). Qualitative data captured that students could smell the water and the water organisms. Because of the outdoor setting, and all the smells that surround a pond, students could have reported more *anxiousness* and *stress* due to the adverse sense of smell associated with the pond.

The timeliness of the administration of the surveys as well as the time during the academic school year and the season in which this research study was conducted were also limitations.

First, controlling the duration of time between each survey and the number of the surveys administered would give more even data points to consider. The Post Experience Survey: I Owl Pellets and the Post Experience Survey: II Pond Studies were given essentially back to back from each other. That said, student responses could also have been either negatively or positively impacted by the number of surveys administered over the course of the study. Negative implications could be related back to Dabrowski's *psychomotor overexcitability* (Tolan, 1999) where students have high energy and have a feeling of being "on the go". Eide (2004) stated that gifted students tend to learn with less repetition of content, and in this case, the students may have become desensitized to the content on the Post Experience Survey. Positive implications could have also occurred because with more surveys administered, students could have responded more candidly and become more aware of their moods.

Next to consider is that the Baseline Instrument was administered the week after spring break. Students' stress levels may have been less heightened than a typical time period because they, in essence, had a vacation from school and the cognitive demands of academic coursework. In addition, the month in which this study was conducted coincided with major academic testing. During the month of May, the population in this research study take tests in Measures of Academic Progress (MAP) in the areas of

reading, language, math, and for fifth graders, science. They also take the state comprehensive assessments in the same areas. In addition to these tests, fifth grade students in the Exceptionally Gifted Program also take middle school placement assessments. In the review of research, Han (2009) identified that increased testing can cause mental fatigue, which in turn cause negative emotions. The study conducted by Peterson (2009) reported that gifted students identified academics as the most stressful, challenging life events. Therefore, the time during the school year that this study was administered could have limited the outcome.

The last element of time to consider that may have been a limitation was season. Knowing that this research study was conducted during spring may have influenced students' reports of time spent outdoors. The reported increase of time spent outdoors may have been attributed to the increasing daylight hours. Conversely, if this study was conducted in the fall, students may have reported a decrease in time spent outdoors.

Implications of this study and the positive results obtained from the study could help shift teacher mindframes about the importance of interaction with nature, both in the classroom setting and in an outdoor setting. Additionally, this study also draws attention to the uniqueness of gifted learners, especially as it pertains to gifted emotions and their unique intensities as defined by Dabrowski (Mofield, 2015).

Since gifted students feel intense emotions (which they have a tendency to mask) and intentional interaction with nature reduces stress in gifted students, it would seem imperative for teachers to plan and incorporate the natural world into curriculum studies

or into the learning environment of the classroom. As intentional interaction with nature was the most beneficial to stress reduction, curriculum studies could include nature walks, nature journals, outdoor learning centers, and field trips that allow students to explore nature while still meeting curriculum objectives. However, not all school settings have access to natural environments that would support intentional interaction. Therefore administrators of schools would either need to make natural environments more accessible to students, or perhaps strongly suggest to their staff that elements of nature need to be incorporated in the classroom for the benefit of their students. Teachers could include live plants in the classroom, incorporate elements of sand, rock or seashells into the classroom, or even play music that capitalizes on the sounds of nature.

Communicating the results of this study to my colleagues and administrator would be the first step to implement change in regards to perceptions of the gifted child and the role that interaction with nature has on gifted students' stress and anxiety levels. Understanding that a homogeneous population of gifted students in a specific gifted program may be a unique situation to the majority of the general population, administrators could extend the information obtained through this study to a wider audience than a classroom teacher. From there, these progressive movements could ripple through other schools in the district, other districts within the state, and ultimately, other states.

Going forward in the investigation of the relationship between gifted students and engagement with the natural environment, I would make changes to the tools, settings,

and the complexities of time to reduce or hopefully eliminate the limitations detailed above. Changing the format of the tool from a physical paper and pencil format to a virtual electronic format and using a neutral administer could alleviate any potential limitations of students' responses. Further research that could eliminate or minimize the limitations previously mentioned could also prove the important role that intra-action with nature has on the minds of gifted learners. After more research was conducted, I would seek a larger outlet to communicate my research findings such as writing curriculum to support intentional intra-action of gifted students with nature, or encapsulate the research studies into an advanced degree and ultimately, a cohesive book reporting my studies.

Working with gifted students motivated me to begin my formal education with Hamline to learn more about these unique learners. Through reflection of my own childhood experiences, and the perceived levels of stress these students were enduring, it seemed natural to ask, "Can student engagement in the natural environment reduce stress in gifted students?" Finding that there is a positive correlation between reduction of stress levels and engagement with the natural world, and students reported a significant decrease in identifying with the emotion of *stress* and *anxiousness*, it would seem instrumental to design experiences to capitalize on this data. Integrating intentional hands-on, minds-on interaction with the natural world will allow gifted students to "gradually understand the broader principles as they develop the cognitive skills to make more abstract generalizations" (Pfouts, p. 57). Gifted students are complex, and their

emotions and intensities do not exist in isolation, just as nature does not exist in isolation. Perhaps we should consciously integrate and promote intra-action because, as John Muir stated: “When we try to pick out anything by itself, we find it is hitched to everything else in the universe.” (Allen, 2013).

APPENDIX A

Student Survey #1

1. What sense is the most favorable for you?

sight smell touch taste sound

Why?_____

2. What sense if the most unfavorable for you?

sight smell touch taste sound

Why?_____

3. In the past week, have you felt any of the following? (Circle all that apply)

stressed nervous anxious afraid worried self-doubting perfectionistic

4. In the past week, how often have you felt the following?

	None (0 / 7 days)	Some (2 / 7 days)	Often (5 / 7 days)	Daily (7 / 7 days)
Stressed				
Nervous				
Anxious				
Afraid				
Worried				
Self - doubting				
Perfectionistic				
Other_____				
Other_____				

5. What do you believe causes these feelings or lack of these feelings?

6. What do you do to relax / what is relaxing to you?

---

7. How much time do you spend outdoors on a typical school day (excluding recess time)?

0 minutes 1 - 30 minutes 31 - 60 minutes 60+ minutes

8. What activities do you typically do outdoors?

---

9. What is your gender?

Female Male

10. Other comments: Is there anything else you would like to share?

APPENDIX B

Student Survey #___

1. What sense did you experience?

   sight smell touch taste sound

How?_____

2. During this experience, did you feel any of the following? (Circle all that apply)

stressed nervous anxious afraid worried self-doubting perfectionistic happy relaxed hopeful joy peaceful confidence inquisitive

3. What thoughts and feelings do you have about this experience?

4. In the past week, how often have you felt the following?

	None (0 / 7 days)	Some (2 / 7 days)	Often (5 / 7 days)	Daily (7 / 7 days)
Stressed				
Nervous				
Anxious				
Afraid				
Worried				
Self - doubting				
Perfectionistic				
Other _____				
Other_____				

5. In the past week, how often have you felt the following?

	None (0 / 7 days)	Some (2 / 7 days)	Often (5 / 7 days)	Daily (7 / 7 days)
Happy				
Relaxed				
Hopeful				
Joy				
Peaceful				
Confident				
Inquisitive				
Other_____				
Other_____				

6. How much time have you spent outdoors on a typical school day this week (excluding recess time)?

0 minutes 1 - 30 minutes 31 - 60 minutes 60+ minutes

7. What activities did you do outdoors?

---

8. What is your gender?

   Female Male

9. Other comments: Is there anything else you would like to share?

Appendix C

Baseline Instrument Data Results, April 5 and 6, 2017				
Q1	**What sense is the most auspicious (favorable) for you?**			
Sight	25	64%		
Smell		0%		
Touch	9	23%		
Taste	2	5%		
Sound	3	8%		
Total	**39**	**100%**		
Note: Three students reported multiple senses and therefore are not reflected in these percentages.				
Q2	**What sense if the most adverse (unfavorable) for you?**			
Sight	1	3%		
Smell	16	41%		
Touch	3	8%		
Taste	13	33%		
Sound	6	15%		
Total	**39**	**100%**		
Note: Three students reported that no sense was unfavorable for them and therefore are not reflected in these percentages.				

Q7	**How much time do you spend outdoors on a typical school day (excluding recess time)?**			
0 Minutes	2	5%		
1-30 Minutes	17	41%		
31-60 Minutes	10	24%		
60+ Minutes	12	29%		
Total	**41**	**100%**		
Note: Three students reported that no sense was unfavorable for them and therefore are not reflected in these percentages.				

Q4	**In the past week, how often have you felt the following?**								
	Frequency Data					***Percentage of Frequency***			
	None	Some	Often	Daily		None	Some	Often	Daily
Stressed	10	19	7	3		24%	45%	17%	7%
Nervous	12	22	5	0		29%	52%	12%	0%
Anxious	17	8	7	5		40%	19%	17%	12%
Afraid	19	10	6	0		45%	24%	14%	0%
Worried	18	16	5	1		43%	38%	12%	2%
Self-Doubting	12	13	9	4		29%	31%	21%	10%
Perfectionistic	16	11	5	4		38%	26%	12%	10%
Note: 42 Students responded to the question.									

Appendix D

Post Experience Survey: I Owl Pellets, Administered on May 2 and 3, 2017

Q1	What sense did you experience?		
Sight	30	75.00%	
Smell	3	7.50%	
Touch	29	72.50%	
Taste	1	2.50%	
Sound	2	5.00%	
Note: 40 Students responded to the question, but could identify more than one choice, if applicable.			

Q2	During this experience, did you feel any of the following? (Circle all that apply)		
Stressed	18	45.00%	
Nervous	9	22.50%	
Anxious	12	30.00%	
Afraid	4	10.00%	
Worried	9	22.50%	
Self-Doubting	5	12.50%	
Perfectionistic	7	17.50%	
happy	16	40.00%	
relaxed	13	32.50%	
hopeful	10	25.00%	
joy	13	32.50%	
peaceful	7	17.50%	
confidence	17	42.50%	
inquisitive	15	37.50%	
Note: 40 Students responded to the question, but could identify more than one choice, if applicable.			

Q6	How much time have you spent outdoors on a typical school day this week (excluding recess time)?		
0 Minutes	1	2.50%	
1-30 Minutes	15	37.50%	
31-60 Minutes	11	27.50%	
60+ Minutes	13	32.50%	
Total	**40**	**100.00%**	

Q4	In the past week, how often have you felt the following?								
	Frequency Data					*Percentage of Frequency*			
	None	Some	Often	Daily		None	Some	Often	Daily
Stressed	7	14	17	2		18%	35%	43%	5%
Nervous	16	16	6	2		40%	40%	15%	5%
Anxious	17	15	6	2		43%	38%	15%	5%
Afraid	27	9	3	1		68%	23%	8%	3%
Worried	15	14	5	4		38%	35%	13%	10%
Self-Doubting	19	10	9	2		48%	25%	23%	5%
Perfectionistic	16	13	6	5		40%	33%	15%	13%
Note: 42 Students responded to the question.									

Q5	In the past week, how often have you felt the following?								
	Frequency Data					*Percentage of Frequency*			
	None	Some	Often	Daily		None	Some	Often	Daily
Happy	1	7	14	18		3%	18%	35%	45%
Relaxed	5	8	14	12		13%	20%	35%	30%
Hopeful	3	18	13	6		8%	45%	33%	15%
Joy	4	14	14	7		10%	35%	35%	18%
Peaceful	6	12	11	11		15%	30%	28%	28%
Confident	3	11	16	10		8%	28%	40%	25%
Inquisitive	3	15	10	11		8%	38%	25%	28%
Note: 42 Students responded to the question.									

Appendix E

Post Experience Survey: II Pond Studies, Administered on May 4 and 5, 2017

Q1	What sense did you experience?		
Sight	37	95%	
Smell	7	18%	
Touch	16	41%	
Taste	0	0%	
Sound	6	15%	
Note: 39 Students responded to the question, but could identify more than one choice, if applicable.			

Q2	During this experience, did you feel any of the following? (Circle all that apply)		
Stressed	10	25.64%	
Nervous	7	17.95%	
Anxious	8	20.51%	
Afraid	4	10.26%	
Worried	7	17.95%	
Self-Doubting	7	17.95%	
Perfectionistic	5	12.82%	
happy	27	69.23%	
relaxed	16	41.03%	
hopeful	16	41.03%	
joy	20	51.28%	
peaceful	14	35.90%	
confidence	11	28.21%	
inquisitive	13	33.33%	
Note: 39 Students responded to the question, but could identify more than one choice, if applicable.			

Q6	**How much time have you spent outdoors on a typical school day this week (excluding recess time)?**		
0 Minutes	1	2.56%	
1-30 Minutes	13	33.33%	
31-60 Minutes	9	23.08%	
60+ Minutes	16	41.03%	
Total	**39**	**100.00%**	

Q4	**In the past week, how often have you felt the following?**								
	Frequency Data					***Percentage of Frequency***			
	None	Some	Often	Daily		None	Some	Often	Daily
Stressed	10	10	14	5		26%	26%	36%	13%
Nervous	13	16	7	2		33%	41%	18%	5%
Anxious	18	10	7	4		46%	26%	18%	10%
Afraid	21	11	5	1		54%	28%	13%	3%
Worried	13	15	5	4		33%	38%	13%	10%
Self-Doubting	16	12	5	6		41%	31%	13%	15%
Perfectionistic	20	7	4	8		51%	18%	10%	21%
Note: 39 students responded to the question.									

Q5	**In the past week, how often have you felt the following?**								
	Frequency Data					***Percentage of Frequency***			
	None	Some	Often	Daily		None	Some	Often	Daily
Happy	1	6	11	21		3%	15%	28%	54%
Relaxed	5	8	12	14		13%	21%	31%	36%
Hopeful	3	12	13	11		8%	31%	33%	28%
Joy	5	7	13	14		13%	18%	33%	36%
Peaceful	4	12	9	12		10%	31%	23%	31%
Confident	3	7	11	17		8%	18%	28%	44%

Inquisitive	5	8	13	11		13%	21%	33%	28%	
Note: 39 students responded to the question.										

Appendix F

Post Experience Survey: III Indoor Terrariums,

Administered on May 22 and 23, 2017

Q1	**What sense did you experience?**		
Sight	31	76%	
Smell	9	22%	
Touch	28	68%	
Taste	0	0%	
Sound	2	5%	
Note: 41 Students responded to the question, but could identify more than one choice, if applicable.			

Q2	**During this experience, did you feel any of the following? (Circle all that apply)**		
Stressed	6	14.63%	
Nervous	5	12.20%	
Anxious	4	9.76%	
Afraid	1	2.44%	
Worried	5	12.20%	
Self-Doubting	4	9.76%	
Perfectionistic	8	19.51%	
happy	18	43.90%	
relaxed	23	56.10%	
hopeful	9	21.95%	
joy	18	43.90%	
peaceful	18	43.90%	
confidence	13	31.71%	
inquisitive	8	19.51%	

Note: 41 Students responded to the question, but could identify more than one choice, if applicable.

Q4	**In the past week, how often have you felt the following?**									
	Frequency Data					***Percentage of Frequency***				
	None	Some	Often	Daily		None	Some	Often	Daily	
Stressed	14	10	11	3		34%	24%	27%	7%	
Nervous	16	14	6	2		39%	34%	15%	5%	
Anxious	16	11	8	2		39%	27%	20%	5%	
Afraid	26	8	2	1		63%	20%	5%	2%	
Worried	16	12	6	2		39%	29%	15%	5%	
Self-Doubting	19	9	4	5		46%	22%	10%	12%	
Perfectionistic	17	11	3	6		41%	27%	7%	15%	
Note: 41 students responded to the question.										

Q5	**In the past week, how often have you felt the following?**									
	Frequency Data					***Percentage of Frequency***				
	None	Some	Often	Daily		None	Some	Often	Daily	
Happy	2	4	15	20		5%	10%	37%	49%	
Relaxed	5	8	12	16		12%	20%	29%	39%	
Hopeful	6	11	10	13		15%	27%	24%	32%	
Joy	4	9	13	15		10%	22%	32%	37%	
Peaceful	4	9	13	14		10%	22%	32%	34%	
Confident	1	10	16	13		2%	24%	39%	32%	
Inquisitive	7	8	15	10		17%	20%	37%	24%	
Note: 41 students responded to the question.										

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