TEACHING THROUGH THE SCREEN: HOW WATCHING *OUR PLANET* IMPACTS ADOLESCENTS' CONNECTION TO NATURE

A thesis presented to the faculty of the Graduate School of Western Carolina University in partial fulfillment of the requirements for the degree of Master of Science in Experiential and Outdoor Education

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April 2023

ACKNOWLEDGMENTS

I would like to thank my committee members and director for their assistance and encouragement. In particular, Dr. Callie Schultz, Dr. Paul Stonehouse, and Dr. Brad Faircloth, without whom I would have not been able to complete this document. I also extend sincere thanks to Janis Brannon and the administrators of Summit Charter School, without whom this thesis would not have been possible. Lastly, I offer my warmest regards and thanks to my family, friends, and wonderful cohort members for their continued support.

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ABSTRACT

TEACHING THROUGH THE SCREEN: HOW WATCHING *OUR PLANET* IMPACTS ADOLESCENTS' CONNECTION TO NATURE

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Climate change is a consistent and growing threat to human life. As current and future generations of youth are the most at risk for adverse effects of climate change, encouraging the development of pro-environmental behaviors in children and adolescents is of growing importance. Adolescents, ages 10-19, are in an ideal age range to develop a connection to nature (CTN) (Braun & Dierkes, 2017; Lumber et al., 2017). During these years, experiences in the outdoors are more likely to impact how young people will value nature in the future, and thus the future development of pro-environmental behaviors (Braun & Dierkes, 2017; Wells & Lekies, 2006). In order to encourage the adoption and development of pro-environmental behaviors more effectively, an emotional affinity for the environment should be established during childhood. Supplementing outdoor experience, the utilization of nature documentaries to develop CTN in adolescents could be valuable in combatting climate change for future generations. This mixed-methods study explored how watching a nature documentary can impact adolescents' connection to nature. The episode had notable short-term impacts on CTN in adolescents, though long-term effects require further study.

Keywords: connection to nature, pro-environmental behavior, adolescent, nature documentary

CHAPTER 1: INTRODUCTION

June 2004. Summer vacation. I'm in my family's living room watching my favorite show, "The Crocodile Hunter." Steve Irwin enthusiastically observes a giant, venomous spider, describing it as "beautiful" and "magnificent." I consider my own fear of spiders—their too-many legs and their too-many eyes. I think they're scary… but not for the Crocodile Hunter. He joyfully interacts with this terrifying spider, treating it like an adorable puppy that he adopted. My mom enters the room, telling me it's time for some fresh air. As I walk into the backyard, it's not long before I happen upon a daddy-long-legs tiptoeing through the grass. I watch this creature, once terrifying to me, as it goes about its business in the backyard, and I begin to consider that it just might be beautiful.

There is no shortage of research on the benefits of spending time in nature (de Lannoy et al., 2020; Twohig-Bennett, 2018). For children and adolescents in particular, the benefits of spending time outside are numerous and difficult to ignore. Boosts to mental health, physical fitness, and improved sleep are a few of the many well-documented benefits of outdoor time (de Lannoy et al., 2020). Additionally, time spent outdoors has been shown to improve classroom engagement and test-taking performance for K-12 students (Coyle, 2010). Alongside these benefits, outdoor time is associated with the development of feelings of "connection to nature" or CTN (Braun & Dierkes, 2017). Connection to nature creates a "sense of belonging" to the natural world, and is therefore "an appreciation and value for all life that transcends any objective use of nature for humanity's purposes" (Lumber et al., 2017, p. 3). As climate change is a significant and growing threat to human life (Bandura & Cherry, 2020; Ebi & Paulson, 2007; Pacheco, 2020), and children are most at risk for its adverse effects (Ebi & Paulson, 2007;

Pacheco, 2020) the need to raise the next generation with pro-environmental values is imminent. In hopes of combatting climate change, researchers have investigated the use of CTN as a means to cultivating pro-environmental behaviors in youth (Braun & Dierkes, 2017; Wells & Lekies, 2006).

Children and adolescents are the ideal population for educators to focus on, as there is a greater potential for children to build a strong CTN that can last into adulthood (Braun & Dierkes, 2017; Lumber et al., 2017; Wells & Lekies, 2006). For the purposes of this paper, "adolescents" are children ages 10-19 (WHO, n.d.). Specifically, people under the age of 18 have the most potential to make life-long meaningful connections to nature (Braun & Dierkes, 2017). Since youth affords a brief, but fertile, window to cultivate CTN, outdoor education professionals have a unique, but fleeting, period to educate and develop young people who care about the environment (Duerden & Witt, 2010; Grenno et al., 2021). Beyond its anthropocentic benefits, CTN can increase environmentally-protective, eco-centric behaviors such as tree-planting (Whitburn et al., 2018) and improve attitudes towards environmental conservation (Berto et al., 2018). Connection to nature has been shown to benefit both human and environmental well-being, but the literature surrounding this topic lacks in-depth exploration of new means (such as engagement with new medias) of developing these connections. As most research surrounding CTN in youth relates to direct, hands-on, outdoor experiences with nature, this study turned instead toward modern digital technology (e.g., television) to explore the impacts of digital, indirect, indoor nature experiences on adolescent CTN.

With the importance of spending time outdoors well documented in the research, why are young people spending less time outside than ever before? Children ages 8-18 are spending nearly eight hours a day on "screen time" for entertainment alone, not including time spent

completing schoolwork, which is also on the rise (CDC, 2018; Rideout et al., 2010). Altogether, more than half of a child's waking hours could be spent looking at a screen. To many outdoor educators, this reality is both startling and terrifying. However, the positive role of "screen time" in the development of modern children and adolescents cannot be overlooked.

There are many negatives associated with young peoples' use of digital technology, including increased instances of depression, anxiety, and sleep deprivation (Limone & Toto, 2021; Smahel et al., 2015). However, social support, the promotion of fitness, and access to mental health services are among some of the benefits of youth technology usage (Nagata et al., 2020). Additionally, augmented reality (AR) has long been known to connect the real and "virtual" worlds through interaction in a 3D environment (Azuma, 1997). For instance, AR apps like Pokémon Go have been shown to increase physical activity (Althoff et al., 2016), bridging the gap between screen time and time outdoors. Such apps are not without problems, however. While an effective means of getting people outdoors and exercising, Pokémon Go, in particular, risks negative impacts on the environment and a lack of connection to real-world ecology (Dorward et al., 2016) to say nothing of its accessibility challenges (Layland et al., 2018).

As advancements in digital technology evolve, educators continually seek to engage students through their natural affinity for technology. In particular, when forced to switch to virtual learning in 2020 due to COVID-19, technology usage and screen time skyrocketed for most students (Goldschmidt, 2020). Many schools were given grants in order to provide students with access to tablets, wi-fi hotspots, or Chromebooks to ensure that virtual schoolwork could be completed (Department of Education, n.d.). Students who before may not have been able to afford or acquire a tablet or Chromebook now have a means of connecting to the internet at home. Now more than ever, access to technology has been broadened to a wider population of

students. One program, ecoEXPLORE through the North Carolina Arboretum, encourages children to get outside, explore native ecology, and engage in citizen science through their innovative online program (McDevitt-Garand, 2022). This thinking implies that by utilizing young people's access to and affinity for technology, outdoor educators can reach a much wider audience at a younger age and begin to foster their connections to nature.

While connecting with young people through technology is easier now than ever before, some remain concerned about too much "screen time" for children and adolescents. For some students, the increase in "screen time" and decrease in time spent outdoors can be attributed to issues of being able to access safe outdoor spaces (Wells & Lekies, 2006; Winter et al., 2020). For example, parental absence due to single- or working-parent households can prevent children from spending time outdoors (Warner, 2021). In another example, with the aforementioned augmented reality games like Pokémon Go, players may not feel safe or comfortable recreating in the public spaces required to participate in gameplay, as classism, racism, and sexism are direct, systemic threats to their well-being (Layland et al., 2018). Thus, while the benefits of spending time in nature are well documented, for many young people, a traditional nature experience simply is not feasible. Yet, human and environmental needs require these children maintain a frequent CTN. Therefore, providing alternative methods of accessing the outdoors for underrepresented populations isa necessity. With screen time increasing and outdoor time decreasing, how might we foster CTN in young people when many rarely go outdoors?

Television provides a means of allowing individuals to experience nature through a screen, whether that screen is a phone or computer or an actual TV. Nature documentaries and endless interactive YouTube content provide students screen-based opportunities to connect with the natural world. Throughout the last several decades, television has often been blamed for

many of humanity's problems: increased violence (Brocato et al., 2010), childhood obesity (Dietz, 2001), and degrading mental health (McVeigh et al., 2016) to name a few. But with educational television shows like *Sesame Street* being lauded for their ability to educate and connect with children (Kearney & Levine, 2019), the *potential* benefits of using television for the purposes of outdoor education cannot be ignored.

One of the most popular and well-known methods of blending television with the outdoors would be through nature documentaries (Koblin, 2020). Nature documentaries can be classified as programs depicting different aspects of the natural world and the interactions between parts of global ecosystems (Arendt & Matthes, 2016). Studies have explored the impact of viewing nature documentaries on pro-environmental behaviors (Arendt & Matthes, 2016; Dunn et al., 2020; Hynes et al., 2020), but these studies largely focused on adult populations. Both Arendt & Matthes (2016) and Dunn et al. (2020) noted that while knowledge and immediate behaviors changed for adults after watching a nature documentary, there was no evidence of any lasting effects on adult pro-environmental behaviors. Further research would be necessary to determine whether these behaviors could be maintained in adults, perhaps if they were repeatedly exposed to similar nature documentaries. Since CTN's impact is especially profound in children (Braun & Dierkes, 2017; Lumber et al., 2017; Wells & Lekies, 2006), might nature documentaries have a more lasting influence on youth?

Although we know that direct, hands-on nature experiences help children and adolescents build connections to nature (Duerden & Witt, 2010), little research addresses the impacts of *viewing* nature through a screen on CTN in adolescents specifically. As television is available to a wider variety of participants, it would be a gross oversight not to explore the use of television as a method of developing CTN in young people. Therefore, the purpose of this study was to

explore the impacts of watching television on adolescents' feelings of connection to nature. Specifically, my research question was: what are the impacts of viewing a 48-minute *Our Planet* episode on adolescents' feelings of connection to nature? I will begin by providing an overview of the literature, followed by an explanation of my methodology: convergent mixed methods utilizing arts-based educational research (ABER). After a brief explanation of my quantitative results, I will transition to my manuscript with qualitative results and discussion, then conclude with final thoughts and recommendations.

CHAPTER 2: LITERATURE REVIEW

The following review of literature will more closely examine current and previous research surrounding connection to nature (CTN) and how it impacts pro-environmental behaviors throughout a person's life, as well as the implications of digital technology and nature documentaries within the realm of outdoor education.

Connection to Nature: Definition and Impacts

CTN Defined

Connection to nature has been defined by Lumber et al. (2017) as a "sense of belonging" to the natural world (p. 3). Arendt & Matthes (2016) further elaborated on this definition and defined CTN as "an individual's sense about the degree to which he or she is part of nature" (p. 454). Impacts of connection to nature have been well documented. For instance, Sandifer et al. (2015) examined a comprehensive list of studies that explore the benefits related to connection to nature. Improved mood (Lee et al., 2014; Shin et al., 2011), reduced anxiety (Lee et al., 2014; Song et al., 2014; Park et al., 2011), and lowered blood pressure (Lee et al., 2014; Song et al., 2014; Tsunetsugu et al., 2013) are a few of the numerous cognitive, psychological, and physiological benefits associated with the development of connection to nature (Sandifer et al., 2015). These benefits extend beyond the individual, however, as a number of scholars have noted CTN's potential to combat climate change through pro-environmental behaviors (Lumber et al., 2017; Sandifer et al., 2015; Wells & Lekies, 2006).

CTN and Pro-Environmental Behavior

Khashe et al. (2015) define pro-environmental behavior as "individual participation in an activity that promotes sustainable… practices by reducing or eliminating negative environmental

impacts" (p. 478). This often involves the individual viewing the protection of the environment as a moral obligation and participating in behaviors such as reuse, recycling, and reducing waste (Arendt & Matthes, 2016; Li et al., 2019, 5; Lumber et al., 2017). Bruni & Schultz (2010) found that pro-environmental behaviors are more likely to be adopted and performed when an individual feels a strong connection to nature. If pro-environmental behaviors are linked to a person's connection to nature, establishing connections to nature is thus an aid in combatting climate change (Bandura & Cherry, 2020; Ebi & Paulson, 2007). As children age into adults, it becomes increasingly difficult to establish behavior-altering moral connections for individuals in any regard, including to the environment (Bolderdijk et al., 2013; Bruni & Schultz, 2010). Therefore, establishing meaningful connections to nature during childhood and adolescence is a promising way to instill a feeling of moral obligation to protect the environment (Bolderdijk et al., 2013; Bruni & Schultz, 2010; Li et al., 2019; Rizzo et al., 2016).

CTN Across the Lifespan: Impacting Pro-Environmental Behaviors

The development of connection to nature has been studied across several age groups. In adult populations, experiencing nature either directly (e.g. a hike in a state park) or indirectly (e.g. visiting a museum exhibit) has little if any prolonged effects on their feelings of connection to nature (Bolderdijk et al., 2013; Krettenauer, 2017; Soga et al., 2016). However, immediate behaviors have been shown to be impacted; for example, after watching *Blue Planet II*, a documentary with an emphasis on the effects of overuse of plastics on ocean ecosystems, adult viewers demonstrated an immediate decline in plastic usage (Hynes et al., 2020). This initial change in behavior is not usually permanent, but can have meaningful effects for conservation organizations looking for awareness and immediate action for a cause (Arendt & Matthes, 2016). Arendt & Matthes (2016) found that after viewing a conservation-oriented documentary,

individuals were more likely to donate money to a conservation organization related to the issue depicted in the documentary. Although short-term behaviors were altered, little evidence suggested that this philanthropic behavior would extend far beyond this study (Arendt & Matthes, 2016).

While immediate behaviors may be impacted, there is little evidence that connection to nature is easily developed and maintained for individuals after reaching the age of 18 (Krettenauer, 2017; Soga et al., 2016). Connection to nature is developed most easily during childhood and adolescence (Braun & Dierkes, 2017; Krettenauer, 2017), with direct experiences in or with the outdoors having the most lasting impacts on individuals (Duerden & Witt, 2010). However, an important factor in outdoor experiences having a legitimate impact on future behaviors is the age of the individual that is participating in an outdoor experience (Braun & Dierkes, 2017). According to Braun & Dierkes (2017), children and adolescents who develop these values between ages 5-12 are statistically more likely to maintain values developed in childhood into adulthood. As children get older, there is a marked decline in their development of new pro-environmental behaviors (Krettenauer, 2017; Negev et al., 2008). As children ages 5-12 have been shown to be the population with the most potential to develop lasting CTN, and are underrepresented in the literature, they are an ideal population to study.

Teaching with Technology

Digital Technology

The focus of this study will be on the impact of nature documentaries specifically on CTN. However, it is important to explore the significance of other aspects of digital technology use as they could potentially also be used to develop CTN. Throughout the last decade, there has been a pronounced global increase in digital technology use (Olofsson et al., 2019; Ting et al.,

2020). *Digital technology* is "electronic tools, systems, devices and resources that generate, store or process data" (Victoria State Government, n.d., para. 1). With smartphones, tablets, and smart TVs becoming more affordable and widely available, more people than ever before have access to a seemingly infinite amount of media and information (Kaarakainen & Saikkonen, 2021). Digital technology has effectively become an "extension of ourselves," with many people's social lives and livelihoods either somewhat or completely dependent upon digital technology usage (Silk et al., 2016). With their widespread availability, digital devices can even help increase the accessibility of educational applications; thousands (or even millions) of free, downloadable mobile applications available provide an abundance of possibilities for educator and student use (Kaarakainen & Saikkonen, 2021; Zydney & Warner, 2016).

Mobile apps can be used as a means of delivering complex information to the masses in digestible "bites" (Zydney & Warner, 2016). With ease of access and development, mobile apps are already being explored and utilized as a way of encouraging the average person to engage in citizen science (Zydney & Warner, 2016). Some conservation organizations have made mobile apps to assist in increasing and improving ecological awareness among users, such as Merlin Bird ID by Cornell and iNaturalist (Dorward et al., 2016). Developing an easy-to-use application that can be accessed on widely-available smartphones is an effective means of reaching a wide audience to deliver a conservation-focused message (Dorward et al., 2016). However, accessibility remains an issue surrounding these augmented reality apps. Sexism, classism, and ableism present hurdles that can block many users from being able to safely recreate while using the app (Layland et al., 2018). For example, recreating outside alone for women, BIPOC, and LGBTQ+ individuals can represent a real danger of physical harm in many communities (de Lannoy et al., 2020; Layland et al., 2018; Winter et al., 2020). The aforementioned AR app

Pokémon Go was criticized for its lack of accommodations for disabled individuals who could not reach necessary landmarks within the game due to stairs, steep unpaved pathways, and other obstacles (Dangor, 2021).

For many, barriers to the outdoors can exist even at home. Lack of green space and issues of neighborhood safety are two of many factors that can impact the time people spend outdoors (Warner, 2021). This can prevent some people from being able to explore their own communities, let alone state or national parks. For children and adolescents in particular, lack of parental presence due to working and/or single-parent households can also inhibit the ability to spend substantial time outside of their home (Warner, 2021). As use of conservation apps is largely dependent on recreating in the outdoors, issues of safety, access, and comfort for users are of the utmost importance when it comes to app usage.

Television

The invention and subsequent global household adoption of the television is one of the most culturally impactful technological developments of the twentieth century (Webb, 2005). Since this development, television has been explored and exploited as a means of influencing populations around the world in a variety of ways (Campos et al., 2016; Gianfredi et al., 2020). Education, marketing, and propaganda are but a few of the ways that individuals and corporations alike have utilized television as a vehicle for delivering their messages to millions of households (Campos et al., 2016; Gianfredi et al., 2020).

For decades, studies have been conducted to determine what effects different types of televised media have on varied populations (Campos et al., 2016; Gianfredi et al., 2020; Hwang & Borah, 2022). Short-term instances of violence, aggression, and/or fearfulness were shown in adolescents exposed to violent media (Browne & Hamilton-Giachritsis, 2005), indicating that

media content can have notable effects on children's behavior and mental health (Kirkorian et al., 2009). For instance, educational television can prepare young children for school and build communication skills (Kearney & Levine, 2019; Linebarger & Walker, 2005). As televisions have become more affordable and widely available, television programming has similarly become more accessible to a wider viewership (Webb, 2005). Since its inception, public television has been aimed at increasing accessibility and relevance to local populations (Janes, 1987). For example, *Sesame Street*, perhaps the first educational children's show to air on public television (Kearney & Levine, 2019), was originally developed in 1969 specifically with the goal of narrowing the gaps in education among children from different backgrounds (Mares & Pan, 2013). Benefits of exposing children to educational television include improving vocabulary, school readiness, and communication skills (Kearney & Levine, 2019; Kostyrka-Allchorne et al., 2017; Linebarger & Walker, 2005). However, there is some evidence that certain children's programs can inhibit or negatively impact children's abilities to communicate and develop communication skills (Kostyrka-Allchorne et al., 2017; Linebarger & Walker, 2005). For example, shows like *Teletubbies* that do not use verbal communication showed a negative impact on communication skills for children, while story-telling shows using language to communicate exhibited the opposite effect (Linebarger & Walker, 2005). As exciting imagery stimulates children's minds, verbal communication is what has been shown to have a lasting educational impact. With this information in mind, nature documentaries, in particular, are able to bridge the gap between exciting visuals and educational verbal communication.

Nature Documentaries

Nature documentaries are a popular, effective blend of education and entertainment (Koblin, 2020). This category of documentaries depicts the interactions between different parts

of the natural world (Arendt & Matthes, 2016), largely with the goal of education and/or awareness (Dunn et al., 2020; Hynes et al., 2020). Nature documentaries, as educational programming aimed at a wide age demographic, have the potential to promote pro-environmental behaviors in viewers (Arendt & Matthes, 2016). There is a notable body of research discussing the impact of nature documentaries on pro-environmental behaviors in adult populations (Arendt & Matthes, 2016; Dunn et al., 2020; Hynes et al., 2020). However, adult behaviors, as previously discussed, are often impacted by short-term behavioral changes with little evidence of any lasting impact on behavior. (Arendt & Matthes, 2016). There is far less research on the impacts of nature documentaries on pro-environmental behaviors in children and adolescents. Nature documentaries can be found on most streaming platforms, as well as on cable television. With the issues of access to the outdoors noted previously in this review, and as nature documentaries provide a gateway for viewers to experience nature without leaving the safety of their own home, they have potential to be an easily accessible means of developing connection to nature, and thus pro-environmental behaviors, in adolescents.

CHAPTER 3: METHODOLOGY & METHODS

The purpose of this study was to explore the impacts of watching television on adolescents' feelings of connection to nature (CTN). Specifically, my research question was: what are the impacts of viewing a 48-minute *Our Planet* episode on 6th graders' feelings of connection to nature? I employed a convergent mixed methods design (Creswell & Creswell, 2018) utilizing Arts-Based Educational Research (ABER) to inform my qualitative inquiry (Bertling, 2020; Greenwood, 2012). In the qualitative portion of the study, my methods included the Draw, Write, Tell method (Angell et al., 2014) and participant interviews (Marshall et al., 2022). For the quantitative portion of this study, I utilized pre/post-surveys featuring the Revised Connection to Nature Index (Cheng & Monroe, 2012; Creswell & Creswell, 2018).

Study Overview

The study population was two 6th grade science classes, each consisting of 15 students, at Summit Charter School in Cashiers, NC. As part of the convergent mixed methods design, a separate 7th grade class was the control group and completed pre/post Connection to Nature Index (CNI) surveys without watching the intervention, an episode *of Our Planet*. The 6th grade classes completed a pre/post CNI survey before and after viewing a 48-minute *Our Planet* episode and participated in the Draw, Write, Tell method (a reflective activity), both of which were considered the intervention for this study. Sixth and seventh grade students fall within the ideal window for developing CTN and were an easily accessible population for this study. *Our Planet* was selected specifically as it is age-appropriate and has been uploaded for free on YouTube, making it a more accessible program for those without streaming service subscriptions. I describe my methods below in further. As an introductory timeline, data

collection took place over four consecutive school days. On the first day of data collection, all participants filled out a pre-experience survey. On day two, the intervention classes watched the *Our Planet* episode. On the third day, participants in the intervention classes created an art piece (Draw), wrote artist statements (Write), then met with me in small groups to discuss their creations (Tell). On the fourth day, all participants filled out a post-experience survey.

Site Selection and Population Sampling

This study took place at Summit Charter School in Cashiers, North Carolina. This is a public, rural, charter school with approximately 24% of the student population classified as minorities (US News, 2021). The race/ethnicity demographics for students at Summit Charter School during the 2020-2021 school year were 76.2% White, 18.8% Hispanic/Latino, 4.6% multiracial, and 0.4% Asian or Asian/Pacific Islander, with a largely even gender distribution (US News, 2021). Average class size is approximately 16-18 students per classroom. This school was selected due to researcher proximity and access to the student population via teacher connections.

The participant populations for this study were the 6th and 7th grade science classes at Summit Charter School. When recruiting a classroom to participate in this study, there was prolonged difficulty finding a teacher to agree to partner with me. After having a classroom fall through at the last minute, the 6th and 7th grade classes at Summit Charter School were selected as their teacher was willing to host this study. As 6th and 7th grade students fall into the ideal age range to build CTN, and they were easily accessible, these populations were selected (Braun & Dierkes, 2017). Based on previous studies, a sample size of 16-24 was ideal. This number allows comparable data to be collected, while providing an adequate buffer for students who chose not to participate, and for potential non-participation from some students (Braun & Dierkes, 2017;

Duerden & Witt, 2010; Grenno et al., 2021). A total of 25 participants took part in this study, 18 in the treatment group (6th grade) and 7 in the control group (7th grade). As I was working with minors, IRB approval was attained before the study took place. There was minimal risk involved with this study.

Why *Our Planet*?

For this study, a 48-minute episode of the Netflix series *Our Planet* entitled "Forests" was selected as the program participants viewed. The Emmy-winning series was released on Netflix in 2019 (Our Planet, n.d.) and was the company's most-watched original nature series, with viewership of more than 33 million households upon initial release (Hipes, 2019). The series is family-friendly and focuses on a different habitat or biome each episode. A wide variety of wildlife across the globe are shown interacting in their natural ecosystems and experiencing issues related to human interference and climate change (Our Planet, n.d.). As *Our Planet* is a recent series released through a well-established company (Netflix) in collaboration with a respected conservation organization, the World Wildlife Foundation (WWF) (Our Planet, n.d.; World Wildlife Foundation, n.d.), it can be considered a factual source of information with potential for bias. In fact, the involvement of the WWF, as an organization with a conservation-based mission, all but ensures that a conservation bias is present within the episodes of *Our Planet.* The conservation message is made clear both within the series itself as well as on the *Our Planet,* Netflix, and WWF websites (Our Planet, n.d.; Netflix, 2019; World Wildlife Foundation, n.d.) Since it is the impact of watching a nature documentary on connection to nature that is being studied, not the neutrality of the series, bias within the documentary is not considered an issue for this study. Further, as previous research surrounding the impact of nature documentaries on CTN utilized media featuring a conservation message (Arendt & Matthes,

2016; Dunn et al., 2020; Hynes et al., 2020), this study did the same. Due to ease of accessibility, age-appropriateness, popularity of the series, and relevance to previous studies, *Our Planet* was selected to be the nature program that students watched for this study. The episode "Forests" features several varieties of forests, including temperate deciduous forests, which make up one of the most prominent ecosystems surrounding western North Carolina (National Park Service, n.d.) where this participant population is located. Students viewed the episode in its entirety.

Qualitative Methods

Arts-Based Educational Research (ABER)

ABER is a methodology that uses art creation as a means of generating data for the purpose of improving education (Bertling, 2020; Greenwood, 2012). A researcher employing ABER as methodology can utilize a wide variety of artistic mediums, including but not limited to paint, dance, puppetry, and live theater (Angell et al., 2014). ABER is valuable as a means of data generation as it does not rely on verbal communication (Muhr, 2020). As the participants within this study are adolescents, ABER as a methodology provides a more inclusive means of communicating with young participants who may lack the proper vocabulary to express abstract concepts (Blaisdell et al., 2018). Adolescents today have grown up in an environment surrounded by digital media, and their exposure to the internet and social media since a young age makes the use of images as a means of self-expression not unusual, and potentially preferable, for a population of 6th grade students (Prinstein et al., 2020). Middle-schoolers, in particular, are adept at using digital images as a means of self-expression through exposure to and use of various social media platforms in their personal as well as school lives (Kimbell-Lopez et al., 2016). Therefore, creation of an art piece is an ideal means of self-expression for this population. ABER has been used by several previous studies with children and adolescents (Angell et al., 2014;

Blaisdell et al., 2018; Muhr, 2020; Rufo, 2012), and the allowance for creativity, autonomy, and expression for participants within the study creates a mutually-beneficial relationship for participant and researcher. Participants are able to express themselves using their preferred means of communication, while researchers are provided with artwork interpretations by the participant, helping to reduce potential misinterpretation of the data generated. Potential drawbacks with ABER could include accidental misinterpretation of participants' artworks and participant discomfort with creating and/or sharing art, leading to a lack of usable data. The method "Draw, Write, Tell" (Angell et al., 2014) helps to alleviate some of these potential drawbacks by engaging participants directly in the interpretation, making it an appropriate qualitative method for this study.

Draw, Write, Tell (DWT)

The Draw, Write, Tell method bridges the gap between researcher and young participant as it provides children and adolescents with a method of communication that can be more easily understood by adult researchers (Angell et al., 2014). More specifically, the DWT method allows participants to freely depict their feelings or interpretation of an experience (Draw) and then use their own words as they write "artist statements" to explain their artwork (Write), removing some of the guesswork of researchers (Angell et al., 2014). Finally, I used small group interviews (the "Tell" portion of DWT) to allow participants to discuss their artwork. The DWT data collection took place one day after participants in the treatment group watched the episode of *Our Planet.* At the beginning of the DWT portion of the study, participants were provided with a handout and were asked to "draw a picture about how watching the episode of *Our Planet* made you feel about nature" and "write a few sentences describing what you drew." The DWT handout is shown in Appendix A.

As noted, the DWT method has several potential drawbacks, including the potential of adult misinterpretation of artwork and participants' possible discomfort with sharing their artwork (Angell et al., 2014). Ideally, providing space within small group interviews for participants to describe or explain their artwork allows for researcher interpretations to be checked and guided by participant explanations. The small group setting also allows for students who are less comfortable expressing themselves through art to still have a voice within this study.

Small Group Interviews

After students created their art pieces, I conducted small group interviews with study participants as the "Tell" portion of the Draw, Write, Tell method. Small group interviews allow for open-ended and follow-up questions which can provide a more complete view of data being collected (Marshall et al., 2022), as well as providing a space for researchers to more accurately interpret participant drawings. With 3-5 participants in each group, this allowed for each participant's voice to be heard and was less time-intensive for the researcher.

The art pieces created during the DWT portion of data generation were an integral part of the interview process. In small groups, the students were asked the following guiding questions:

1) What is your name?

2) How old are you?

3) When I say "nature", what does that make you think of?

4) Tell me something about your drawing.

5) How does your drawing show how you feel about nature?

6) How did the video we watched make you feel?

7) What was your favorite part of the video we watched?

8) Do you like watching shows about nature? Why?

An Interview Guide is shown in Appendix B. Flexibility was provided to allow for follow-up questions and organic conversation to occur. The small group interview setting provided a space for participants to inspire and remind others of their own experiences to share. This also presented participants with the opportunity to ask any clarifying questions or present any concerns they had. Interviews were audio recorded and then transcribed, with pseudonyms then assigned to each participant to protect anonymity.

Qualitative Data Analysis

I analyzed the data generated during the qualitative portion of the study based off recommendations by Angell et al (2014) in their DWT case study. To code the data generated during the Draw portion of the DWT exercise, I referred to Lumber et al.'s 5 pathways to nature connection (contact, beauty, meaning, emotion, and compassion) to guide my coding (2017). All of the art pieces were laid out together and then examined for common themes. Each art piece was then placed into a group with other art pieces with similar themes until three general categories emerged. An intercoder from the research team also participated in the coding process to help eliminate bias. Each participant's interview was transcribed and digitally attached to their art piece and artist statement to ensure all data was properly attributed to the corresponding participant.

Quantitative Methods

For the quantitative portion of this study, I used pre- and post-surveys (Creswell & Creswell, 2018). These surveys used the Revised Connection to Nature Index (CNI) for children (Cheng & Monroe, 2012) as a tool for collecting data related to participants feelings of

connection to nature. This tool was validated by Bragg et al. in 2013. The CNI measures children and adolescents' attitudes towards nature and the environment (Salazar et al., 2020), and can be utilized to predict if an individual will engage in pro-environmental behaviors (Cheng & Monroe, 2012). The CNI survey lists each question on a 5-point Likert scale, with 1 = does not like at all and 5 = likes very much. This scale was selected as it is specifically designed for use with children ages 8-12. Since the average age of 6th graders in the United States is 11-12 years old, this allows for use of the CNI with the participant demographic for this study. The CNI is also well-suited to the purpose and research questions of this study in determining students' feelings of connection to nature and the potential for carrying these feelings of connectedness into adulthood. Participants were asked to fill out the same survey featuring the CNI one day before and two days after viewing the *Our Planet* episode in order to determine what (if any) impact nature programming had on their feelings of connection to nature. By allowing two school days and the DWT portion of the study to take place between surveys, this provides a longer intervention time in order to ideally have more significant results within the treatment group. The DWT portion of the study is part of the intervention, as it allows students to reflect on the episode of *Our Planet* and how it made them feel about nature. The survey containing the CNI is shown in Appendix C, with additional demographic questions added including name, age, gender, and race in order to potentially compare data collected among subgroups.

Quantitative Data Analysis

Quantitative data was analyzed using recommendations from Cheng and Monroe (2012) in their toolkit for the Revised Connection to Nature Index, with the addition of an ANCOVA in order to compare the mean post-test scores between the control and treatment groups. An ANCOVA allows you to examine differences between the two groups at post-test while

controlling for their pre-test scores. Instead of simply comparing the changes in mean scores for the intervention group before and after viewing the documentary, an ANCOVA provides more significant analysis in order to determine whether the intervention (the *Our Planet* episode and DWT) had a significant effect on the treatment group.

CHAPTER FOUR: RESULTS

Quantitative Results

I analyzed the data generated during this study based on recommendations from previous studies utilizing the Draw, Write, Tell technique by Angell et al. (2013) and the revised Connection to Nature Index (CNI) by Cheng and Monroe (2012). Cronbach's alpha for the Revised Connection to Nature Index has been found to be 0.92, which is similar to that of the original CNI and is considered "excellent" (Bonett & Wright, 2015).

Using IBM SPSS software and Cheng & Monroe's (2012) recommended method of data analysis, pre- and post-surveys were analyzed. Participant responses were coded in Excel according to Cheng and Monroe's recommendations to determine the mean scores for each survey question both before and after the treatment. After determining the means for both the treatment and control groups' responses, SPSS was used to run an ANCOVA to determine if there was a significant difference in the means of the post-test scores for the treatment group and the control group. An ANCOVA was chosen as it allows for adjustment based on the presence of a covariate, which in this case would be the pre-test scores for both groups. After running the data through SPSS, our p-value was found to be 0.545 with an F-value of 0.378, indicating our data was not statistically significant.

Table 1

Mean and Standard Deviation for Treatment and Control Groups

Group	**Mean**	**Standard Deviation**	**Population size (N)**
Treatment Group	4.206	0.674	18
Control Group	3.857	0.52	7

Total	4.108	0.645	25

There are several potential causes for statistical insignificance, the most substantial being that the sample sizes for both groups were not equal. With 18 participants in the treatment group and 7 for the control group, the large difference in sample sizes made it difficult to accurately compare both groups' post-test scores. Differing sample sizes could skew results as there is not enough data collected to equally compare and contrast between both groups (note the large standard deviations for both groups in Table 1). Based on prior studies regarding CTN in adolescents, a sample size of 16-20 would be ideal to properly determine if there was any significant difference between the treatment and control groups. Another potential cause could be my choice of data collection site. Summit Charter School is a school that intentionally incorporates outdoor education into their curriculum, therefore many participants of my sample population likely may have already felt connected to nature before this study took place. If their baseline level of connection to nature was already high, it is unlikely that watching the *Our Planet* episode would have shown a significant change in participants' CTN. Several pre-surveys had students reporting the highest possible level of connection to nature, allowing no room for change. Finally, the treatment used within this study may have simply been ineffective. One episode of *Our Planet* may not have been enough to effectively alter participants' CTN, or there may have been different nature documentaries that could have been used as a more impactful treatment for this study. With all these factors considered, it is not surprising that the quantitative results for this study were found to be statistically insignificant.

I have opted to write the remainder of my thesis as a manuscript for journal publication, as allowed by the Western Carolina University Experiential and Outdoor Education Handbook.

While the quantitative portion of my data was not statistically significant, the qualitative data generated painted a rich picture of how participants responded to the episode and their feelings about nature. For this reason, my manuscript will focus solely on the qualitative findings from my study.

Per the Western Carolina University Experiential and Outdoor Education Handbook, I have chosen to complete the manuscript thesis format option. This option requires Chapters One, Two and Three plus a full-length journal manuscript formatted to the requirements of a specific journal. The following chapter contains my complete manuscript, which I have chosen to submit to the Journal of Youth and Adolescence. This journal requires authors to submit a manuscript that is 25-30 pages and written in APA format. Figures can be included based on author preference.

CHAPTER FIVE: JOURNAL ARTICLE

Teaching through the screen: How *Our Planet* impacts adolescents' feelings of connection to nature

For consideration for Journal of Youth and Adolescence

Abstract

Climate change is a growing threat to human life. As future generations of youth are the most at risk for adverse effects of climate change, encouraging the development of pro-environmental behaviors in young people is of growing importance. Adolescents are in an ideal age range to develop connection to nature (CTN). During these years, experiences in the outdoors are more likely to impact how youth will value nature, and thus the future development of pro-environmental behaviors. In order to effectively encourage the adoption and development of pro-environmental behaviors, an emotional affinity for the environment should be established during childhood. Utilizing nature documentaries to develop connections to nature in adolescents could be a valuable means of combatting climate change for future generations. This study explored how watching a nature documentary can impact adolescents' connection to nature. The episode had notable short-term impacts on CTN in adolescents, though long-term effects warrant future study.

Keywords: connection to nature, pro-environmental behavior, adolescent, nature documentary

Introduction

June 2004. Summer vacation. I'm in my family's living room watching my favorite show, "The Crocodile Hunter." Steve Irwin enthusiastically observes a giant, venomous spider, describing it as "beautiful" and "magnificent." I consider my own fear of spiders—their too-many legs and their too-many eyes. I think they're scary… but not for the Crocodile Hunter. He joyfully interacts with this terrifying spider, treating it like an adorable puppy that he adopted. My mom enters the room, telling me it's time for some fresh air. As I walk into the backyard, it's not long before I happen upon a daddy-long-legs tiptoeing through the grass. I watch this creature, once terrifying to me, as it goes about its business in the backyard, and I begin to consider that it just might be beautiful.

There is no shortage of research on the benefits of spending time in nature (de Lannoy et al., 2020; Twohig-Bennett, 2018). For children and adolescents in particular, the benefits of spending time outside are numerous and difficult to ignore. Boosts to mental health, physical fitness, and improved sleep are a few of the many well-documented benefits of outdoor time (de Lannoy et al., 2020). Alongside these benefits, time outdoors is associated with the development of feelings of "connection to nature" or CTN (Braun & Dierkes, 2017). Connection to nature creates a "sense of belonging" to the natural world, and is therefore "an appreciation and value for all life that transcends any objective use of nature for humanity's purposes" (Lumber et al., 2017, p. 3). As climate change is a significant and growing threat to human life and children are most at risk for its adverse effects (Ebi & Paulson, 2007; Pacheco, 2020), the need to raise the next generation with pro-environmental values is imminent. In hopes of combatting climate change, researchers have investigated the use of CTN as a means to cultivating pro-environmental behaviors in youth (Braun & Dierkes, 2017; Wells & Lekies, 2006).

Children and adolescents are the ideal population for educators to focus on, as there is a greater potential for youth to build a strong CTN that can last into adulthood (Braun & Dierkes, 2017; Lumber et al., 2017; Wells & Lekies, 2006). For the purposes of this paper, "adolescents" are children ages 10-19 (WHO, n.d.). Since adolescence affords a brief, but fertile, window to cultivate CTN, outdoor education professionals have a unique, but fleeting, period to educate and develop young people who care about the environment (Duerden & Witt, 2010; Grenno et al., 2021). Beyond its anthropocentric benefits, CTN can increase environmentally-protective, eco-centric behaviors such as tree-planting (Whitburn et al., 2018) and improve attitudes towards environmental conservation (Berto et al., 2018). Connection to nature has been shown to benefit both human and environmental well-being, but the literature surrounding this topic lacks in-depth exploration of new means (such as engagement with new medias) of developing these connections. As most research surrounding CTN in youth relates to direct, hands-on, outdoor experiences with nature, this study turned instead toward modern digital technology (e.g., television) to explore the impacts of digital, indirect, indoor nature experiences on adolescent CTN.

With the importance of spending time outdoors well documented in the research, why are young people spending less time outside than ever before? Children ages 8-18 are spending nearly eight hours a day on "screen time" for entertainment alone, not including time spent completing schoolwork, which is also on the rise (CDC, 2018; Rideout et al., 2010). To many outdoor educators, this reality is both startling and terrifying. However, the positive role of "screen time" in the development of modern children and adolescents cannot be overlooked. Social support, the promotion of fitness, and access to mental health services are among some of the benefits of youth technology usage (Nagata et al., 2020).

For some students, the increase in "screen time" and decrease in time spent outdoors can be attributed to issues of being able to access safe outdoor spaces (Wells & Lekies, 2006; Winter et al., 2020). While the benefits of spending time in nature are well documented, for many young people, a traditional nature experience simply is not feasible. Finding alternative methods of providing access to the outdoors for underrepresented populations is, therefore, a necessity. With screen time increasing and outdoor time decreasing, how might we foster CTN in young people when many rarely go outdoors?

Television provides a means of allowing individuals to experience nature through a screen, whether that screen is a phone or computer or an actual TV. One of the most popular and well-known methods of blending television with the outdoors would be through nature documentaries (Koblin, 2020). Studies have explored the impact of viewing nature documentaries on pro-environmental behaviors (Arendt & Matthes, 2016; Dunn et al., 2020; Hynes et al., 2020), but these studies largely focused on adult populations. Both Arendt & Matthes (2016) and Dunn et al. (2020) noted that while knowledge and immediate behaviors changed for adults after watching a nature documentary, there was no evidence of any lasting effects on adult pro-environmental behaviors. Further research would be necessary to determine whether these behaviors could be maintained in adults, perhaps if they were repeatedly exposed to similar nature documentaries. Since CTN's impact is especially profound in children (Braun & Dierkes, 2017; Lumber et al., 2017; Wells & Lekies, 2006), might nature documentaries have a more lasting influence on youth?

Although we know that direct, hands-on nature experiences help children and adolescents build connections to nature (Duerden & Witt, 2010), little research addresses the impacts of *viewing* nature through a screen on CTN in adolescents specifically. As television is available to

a wider variety of participants, it would be a gross oversight not to explore the use of television as a method of developing CTN in young people. Therefore, the purpose of this study was to explore the impacts of watching television on adolescents' feelings of connection to nature. Specifically, my research question was: what are the impacts of viewing a 48-minute *Our Planet* episode on adolescents' feelings of connection to nature? I conducted a convergent mixed-methods study to answer this question; in this manuscript, I share the qualitative results of the Draw, Write, Tell method.

Literature Review

Connection to Nature: Definition and Impacts

CTN Defined

Connection to nature (CTN) has been defined by Lumber et al. (2017) as a "sense of belonging" to the natural world (p. 3). Arendt & Matthes (2016) further elaborated on this definition as "an individual's sense about the degree to which he or she is part of nature" (p. 454). The impacts of CTN are well documented. For instance, Sandifer et al. (2015) examined a comprehensive list of studies that explore the benefits related to connection to nature. Improved mood (Lee et al., 2014; Shin et al., 2011), reduced anxiety (Song et al., 2014; Park et al., 2011), and lowered blood pressure (Tsunetsugu et al., 2013) are a few of the numerous cognitive, psychological, and physiological benefits associated with the development of connection to nature (Sandifer et al., 2015). These benefits extend beyond the individual, however, as a number of scholars have noted CTN's potential to combat climate change through pro-environmental behaviors (Lumber et al., 2017). Lumber et al. (2017) even described five pathways to nature connection that make individual's more likely to develop a strong CTN: contact, beauty, meaning, emotion, and compassion. When a person engages with one or more of these pathways, they increase their chances of bonding with their environment and further developing their CTN (Lumber et al., 2017).

CTN and Pro-Environmental Behaviors

In Khashe et al. (2015), pro-environmental behavior is defined as "individual participation in an activity that promotes sustainable… practices by reducing or eliminating negative environmental impacts" (p. 478). This often involves the individual viewing the protection of the environment as a moral obligation and participating in behaviors such as reuse,

recycling, and reducing waste (Arendt & Matthes, 2016). Bruni & Schultz (2010) found that pro-environmental behaviors are more likely to be adopted and performed when an individual feels a strong connection to nature. If pro-environmental behaviors are linked to a person's connection to nature, establishing connections to nature is thus an aid in combatting climate change (Bandura & Cherry, 2020; Ebi & Paulson, 2007). As children age into adults, it becomes increasingly difficult to establish behavior-altering moral connections for individuals in any regard, including to the environment (Bolderdijk et al., 2013; Bruni & Schultz, 2010). Therefore, establishing meaningful connections to nature during childhood and adolescence is a promising way to instill a feeling of moral obligation to protect the environment (Bolderdijk et al., 2013; Bruni & Schultz, 2010; Rizzo et al., 2016).

The development of connection to nature has been studied across several age groups. In adult populations, experiencing nature either directly (e.g., a hike in a state park) or indirectly (e.g., visiting a museum exhibit) has little if any prolonged effects on their feelings of connection to nature (Bolderdijk et al., 2013; Krettenauer, 2017). However, immediate behaviors have been shown to be impacted; Arendt & Matthes (2016) found that after viewing a conservation-oriented documentary, individuals were more likely to donate money to a conservation organization related to the issue depicted in the documentary. Although short-term behaviors were altered, little evidence suggested that this philanthropic behavior would extend far beyond this study (Arendt & Matthes, 2016).

While immediate behaviors may be impacted, there is little evidence that connection to nature is easily developed and maintained for individuals after reaching the age of 18 (Krettenauer, 2017; Soga et al., 2016). Connection to nature is developed most easily during childhood and adolescence (Braun & Dierkes, 2017; Krettenauer, 2017), with direct experiences

in or with the outdoors having the most lasting impacts on individuals (Duerden & Witt, 2010). According to Braun & Dierkes (2017), children and adolescents who develop values during ages 5-12 are statistically more likely to maintain those values developed in childhood into adulthood. As children ages 5-12 are shown to be the population with the most potential to develop lasting CTN, and are underrepresented in the literature, they are an ideal population to study.

Teaching with Technology

The focus of this study was how nature documentaries can impact CTN in adolescents.. However, it is important to explore the importance of other aspects of digital technology use as they could potentially also be used to develop CTN. Throughout the last decade, there has been a pronounced global increase in digital technology use (Olofsson et al., 2019; Ting et al., 2020). *Digital technology* is "electronic tools, systems, devices and resources that generate, store or process data" (Victoria State Government, n.d., para. 1). With smartphones, tablets, and smart TVs becoming more affordable and widely available, more people than ever before have access to a seemingly infinite amount of media and information (Kaarakainen & Saikkonen, 2021). With their widespread availability, digital devices can even help increase the accessibility of educational applications; thousands of free, downloadable mobile applications provide an abundance of possibilities for educator and student use (Kaarakainen & Saikkonen, 2021; Zydney & Warner, 2016).

Mobile apps can be used as a means of delivering complex information to the masses in digestible "bites" (Zydney & Warner, 2016). With ease of access and development, mobile apps are already being explored and utilized as a way of encouraging the average person to engage in citizen science (Zydney & Warner, 2016). Some conservation organizations have made mobile apps to assist in increasing and improving ecological awareness among users, such as Merlin

Bird ID by Cornell and iNaturalist (Dorward et al., 2016). However, accessibility remains an issue surrounding some mobile apps. Sexism, classism, and ableism present hurdles that can block many users from being able to safely recreate while using these apps (Layland et al., 2018). For example, recreating outside alone for women, BIPOC, and LGBTQ+ individuals can represent a real danger of physical harm in many communities (de Lannoy et al., 2020; Layland et al., 2018; Winter et al., 2020). For many, barriers to the outdoors can exist even at home. Lack of green space and issues of neighborhood safety are two of many factors that can impact the time people spend outdoors (Warner, 2021). This can prevent some people from being able to explore their own communities, let alone state or national parks.

Television and Youth

For decades, studies have been conducted to determine what effects different types of televised media have on varied populations (Campos et al., 2016; Hwang & Borah, 2022). Short-term instances of violence, aggression, and/or fearfulness were shown in adolescents exposed to violent media (Browne & Hamilton-Giachristis, 2005), indicating that media content can have powerful effects on children's behavior and mental health (Kirkorian et al., 2009). For instance, educational television can prepare young children for school and build communication skills (Kearney & Levine, 2019; Linebarger & Walker, 2005). As televisions have become more affordable and widely available, television programming has similarly become more accessible to a wider viewership (Webb, 2005). Since its inception, public television has been aimed at increasing accessibility and relevance to local populations (Janes, 1987). For example, *Sesame Street*, perhaps the first educational children's show to air on public television (Kearney & Levine, 2019), was originally developed in 1969 specifically with the goal of narrowing the gaps in education among children from different backgrounds (Mares & Pan, 2013). Benefits of

exposing children to educational television include improving vocabulary, school readiness, and communication skills (Kearney & Levine, 2019; Kostyrka-Allchorne et al., 2017; Linebarger & Walker, 2005). As exciting imagery stimulates children's minds, verbal communication is what has been shown to have a lasting educational impact. With this information in mind, nature documentaries, in particular, are able to bridge the gap between exciting visuals and educational verbal communication.

Nature Documentaries

Nature documentaries are a popular, effective blend of education and entertainment (Koblin, 2020). This category of documentaries depicts the interactions between different parts of the natural world (Arendt & Matthes, 2016), largely with the goal of education and/or awareness (Dunn et al., 2020; Hynes et al., 2020). Nature documentaries, as educational programming aimed at a wide age demographic, have the potential to promote pro-environmental behaviors in viewers (Arendt & Matthes, 2016). There is a fair body of research discussing the impact of nature documentaries on pro-environmental behaviors in adult populations (Arendt & Matthes, 2016; Dunn et al., 2020; Hynes et al., 2020). However, adult behaviors, as previously discussed, are often impacted by short-term behavioral changes, but little evidence of any lasting impact on behavior. (Arendt & Matthes, 2016). There is far less research on the impacts of nature documentaries on pro-environmental behaviors in children and adolescents. Nature documentaries can be found on most streaming platforms, as well as on cable television. With the issues of access to the outdoors noted previously in this review, and as nature documentaries provide a gateway for viewers to experience nature without leaving the safety of their own home, they have potential to be an easily accessible means of developing connection to nature, and thus pro-environmental behaviors, in adolescents.

Methodology & Methods

The purpose of this study was to explore the impacts of watching television on adolescents' feelings of connection to nature (CTN). Specifically, my research question was: what are the impacts of viewing a 48-minute *Our Planet* episode on sixth graders' feelings of connection to nature? I employed a convergent mixed methods design (Creswell & Creswell, 2018) utilizing Arts-Based Educational Research (ABER) to inform my qualitative inquiry (Bertling, 2020; Greenwood, 2012). In the qualitative portion of the study, my methods included the Draw, Write, Tell method (Angell et al., 2014) and participant interviews (Marshall et al., 2022). In this manuscript, I focus solely on the qualitative methods and results

Study Overview

The study population was two sixth grade science classes, each consisting of 15 students, at Summit Charter School in Cashiers, NC. As part of the convergent mixed methods design, a separate seventh grade class was the control group and completed pre/post Connection to Nature Index (CNI) surveys without watching the intervention, an episode *of Our Planet*. The 6th grade classes completed a pre/post CNI survey before and after viewing a 48-minute *Our Planet* episode and participating in the Draw, Write, Tell method (a reflective activity), both of which were considered the intervention for this study. Sixth grade students fall within the ideal window for developing CTN and were an easily accessible population for this study. *Our Planet* was selected specifically as it is age-appropriate and has been uploaded for free on YouTube, making it a more accessible program for those without streaming service subscriptions. Although I will describe my methods below in further detail, an introductory timeline will be helpful. Data collection took place over four consecutive school days. On the first day of data collection, all participants filled out a pre-experience survey. On day two, the intervention classes watched the

Our Planet episode. On the third day, participants in the intervention classes created an art piece (Draw), wrote artist statements (Write), then met with me in small groups to discuss their creations (Tell). On the fourth day, all participants filled out a post-experience survey.

Site Selection and Population Sampling

This study took place at Summit Charter School in Cashiers, North Carolina. This is a public, rural, charter school with approximately 24% of the student population classified as minorities (US News, 2021). The race/ethnicity demographics for students at Summit Charter School during the 2020-2021 school year were 76.2% White, 18.8% Hispanic/Latino, 4.6% multiracial, and 0.4% Asian or Asian/Pacific Islander, with a largely even gender distribution (US News, 2021).

Based on previous studies, a sample size of 16-24 was ideal. This number allows comparable data to be collected, while providing an adequate buffer for students who chose not to participate, and for potential non-participation from some students (Braun & Dierkes, 2017). Twenty-five participants took part in this study: 18 in the treatment group (sixth grade) and 7 in the control group (seventh grade). As I was working with minors, IRB approval was attained before the study took place. There was minimal risk involved with this study.

Why *Our Planet*?

For this study, a 48-minute episode of the Netflix series *Our Planet* entitled "Forests" was selected as the program participants viewed. The Emmy-winning series, released on Netflix in 2019 (Our Planet, n.d.), is family-friendly and focuses on a different habitat or biome each episode. The series depicts a wide variety of wildlife across the globe interacting in their natural ecosystems and experiencing issues related to human interference and climate change (Our Planet, n.d.). Since *Our Planet* is a recent series released through a well-established company

(Netflix) in collaboration with a respected conservation organization, the World Wildlife Foundation (WWF) (Our Planet, n.d.; World Wildlife Foundation, n.d.), it can be considered a factual source of information with potential for bias. In fact, the involvement of the WWF, as an organization with a conservation-based mission, all but ensures that a conservation bias is present within the episodes of *Our Planet.* Since it is the impact of watching a nature documentary on connection to nature that is being studied, not the neutrality of the series, bias within the documentary was not considered an issue for this study. Further, as previous research surrounding the impact of nature documentaries on CTN utilized media featuring a conservation message (Arendt & Matthes, 2016; Dunn et al., 2020; Hynes et al., 2020), this study did the same. Students viewed the episode in its entirety.

Qualitative Methods

Arts-Based Educational Research (ABER)

ABER is a methodology that uses art creation as a means of generating data for the purpose of improving education (Bertling, 2020; Greenwood, 2012). A researcher employing ABER as methodology can utilize a wide variety of artistic mediums, including but not limited to paint, dance, puppetry, and live theater (Angell et al., 2014). As the participants within this study are adolescents, ABER as a methodology provides a more inclusive means of communicating with young participants who may lack the proper vocabulary to express abstract concepts (Blaisdell et al., 2018). Adolescents today have grown up in an environment surrounded by digital media. Their exposure to the internet and social media since a young age makes the use of images as a means of self-expression not unusual, and potentially preferable, for a population of 6th grade students (Prinstein et al., 2020). Middle-schoolers, in particular, are adept at using images as a means of expressing themselves through exposure to and use of various social media

platforms in their personal as well as school lives (Kimbell-Lopez et al., 2016). Therefore, creation of an art piece is an ideal means of self-expression for this population. ABER has been used by several previous studies with children and adolescents (Angell et al., 2014; Blaisdell et al., 2018; Muhr, 2020; Rufo, 2012). Participants are able to express themselves using their preferred means of communication, while researchers are provided with artwork interpretations by the participant, helping to reduce potential misinterpretation of the data generated. Potential drawbacks with ABER include accidental misinterpretation of participants' artworks and participant discomfort with creating and/or sharing art, leading to a lack of usable data. The method "Draw, Write, Tell" (Angell et al., 2014) helps to alleviate some of these potential drawbacks by engaging participants directly in the interpretation of their own art, , making it an appropriate qualitative method for this study.

Draw, Write, Tell (DWT)

The Draw, Write, Tell method bridges the gap between researcher and young participant as it provides children and adolescents with a method of communication that can be more easily understood by adult researchers (Angell et al., 2014). More specifically, the DWT method allows participants to freely depict their feelings or interpretation of an experience (Draw) and then use their own words as they write "artist statements" to explain their artwork (Write), removing some of the guesswork of researchers (Angell et al., 2014). Finally, I used small group interviews (the "Tell" portion of DWT) to allow for participants to discuss their artwork. At the beginning of the DWT portion of the study, participants were provided with a handout and were asked to "draw a picture about how watching the episode of *Our Planet* made you feel about nature" and "write a few sentences describing what you drew." The DWT handout is shown in Appendix A.

Small Group Interviews

After students created their art pieces, I conducted small group interviews with study participants as the "Tell" portion of the Draw, Write, Tell method. Small group interviews allow for open-ended and follow-up questions which can provide a more complete view of data being collected (Marshall et al., 2022), as well as providing a space for me to more accurately interpret participant drawings. With 3-5 participants in each group, this allowed for each participant's voice to be heard and was less time-intensive for the researcher.

The art pieces created during the DWT portion of data generation were an integral part of the interview process. In small groups, I asked participants the following guiding questions:

1) What is your name?

2) How old are you?

3) When I say "nature", what does that make you think of?

4) Tell me something about your drawing.

5) How does your drawing show how you feel about nature?

6) How did the video we watched make you feel?

7) What was your favorite part of the video we watched?

8) Do you like watching shows about nature? Why?

An Interview Guide is shown in Appendix B. Flexibility was provided to allow for follow-up questions and organic conversation to occur. The small group interview setting provided a space for participants to inspire and remind others of their own experiences to share. This also presented participants with the opportunity to ask any clarifying questions or present any concerns they had. Interviews were audio recorded and then transcribed with pseudonyms assigned to each participant to protect anonymity.

Qualitative Data Analysis

I analyzed the data generated during the qualitative portion of the study based off recommendations by Angell et al (2014) in their DWT case study. To code the data generated during the Draw portion of the DWT exercise, I referred to Lumber et al.'s 5 pathways to nature connection (contact, beauty, meaning, emotion, and compassion) to guide my coding (2017). All the art pieces were laid out together and then examined for common themes. Each art piece was then placed into a group with other art pieces with similar themes until three general categories emerged. An intercoder from the research team also participated in the coding process to help eliminate bias. Each participant's interview was transcribed and digitally attached to their art piece and artist statement to ensure all data was properly attributed to the corresponding participant.

Results & Discussion

I conducted the Draw, Write, Tell activity with small group interviews to explore if or how the episode of *Our Planet* impacted participants. Participant drawings focused largely on themes found within the *Our Planet* episode, with 15 of the 18 participants creating art pieces that directly referenced or featured animals or scenes from the episode. The remaining three participants created artwork that depicted their emotions while viewing the episode. After viewing all 18 art pieces, three prominent themes among the art pieces emerged: animals, evoking emotions, and human/nature interactions. Throughout the following section, I will break down each theme in detail with examples from participants, each of whom have been assigned a pseudonym.

Animals

(Above, L to R) ***Figure 1.*** *Carson's drawing and* ***Figure 2.*** *Mitchell's drawing*

(L to R) ***Figure 3.*** *Erika's drawing and* ***Figure 4.*** *Marisa's drawing*

For 10 of the 18 participants, animals featured in the episode were the main focus of their art piece. Arendt & Matthes (2016) have previously noted that showing images of charismatic animals is an effective means of increasing engagement with conservation media. As the majority of participants drew animals they saw in the episode, and all 18 participants mentioned animals in either their written description or their interview, it is clear that wild animal imagery was memorable for each participant. For several students, the excitement of a "fight scene" was what resonated with them most clearly. Multiple drawings were created depicting the more "exciting" points in the episode. Figure 1 is a drawing by Carson that depicts one of the popular moments in the episode, a fight between male and female bald eagles over food.

Carson particularly connected with this scene as he enjoys fishing himself and he "thought it was cool to see [the eagles] dive in and get the fish." He enjoyed

> "getting to see them fight…with their claws and see their big wings sprawl out and flop all over the place. I thought it was cool to see the small eagle get big fish with their really sharp talons and see them fly away with the fish."

Carson connected his personal experience of fishing to that of the eagles' hunt for food, engaging his interest and creating a memorable experience for him. Lumber et al. (2017) described contact, using the five senses to engage with nature, as one of the five pathways to nature connection. Carson drew on his previous contact experience while engaging with the *Our Planet* episode, which encourages his development of CTN (2017). Duerden and Witt (2016) describe "hands-on experiences" as the most effective way to connect individuals with nature, and Carson's connection between his personal, direct experiences of fishing and the indirect experience of watching a nature documentary has potential to help increase his CTN.

Two other participants, Mitchell and Erika, drew other animals that were popular among the group: the Siberian tiger, as shown in Figure 2, and the African elephant, shown in Figure 3. Mitchell depicted a scene early in the episode that shows a Siberian tiger walking through a snowy forest. During the scene, the narrator explains how there are very few Siberian tigers left in the wild. In his written description, Mitchell describes how he loves the forest and thought "the forest was nice and peaceful and… I also like tigers." He elaborated on his choice of depicting the tiger in his interview, explaining that "Tigers are hard to draw but… the part about the tiger was really neat… I love the forest but I wanted to show the tiger too... The tiger was my favorite part of the video, it made me sad there aren't many left."

Erika drew the African elephants shown in the episode and made direct ties between the presence of elephants and forest health. In their written description, Erika said "I like that elephants are important because they keep specific tree species from being overgrown." In their

interview, Erika went on to tie in forest fires and how they also play a role in keeping forests healthy: “My favorite part of the video is probably when the forest that was burned down started to regrow again and there was new life… I was like ‘wow, that’s special’.”

Mitchell and Erika both described feelings of peace and wonder when thinking about nature. Their choice to draw 1) a scene featuring Siberian tigers, an animal endangered largely due to habitat loss (National Geographic, n.d.) and 2) African elephants, which are currently critically endangered due to poaching and habitat loss (WWF, n.d.), indicates that these scenes and/or animals resonated with them emotionally. Hynes et al. (2021) detail how emotionally bonding with animals through nature documentaries can notably impact conservation behaviors in adults. Further study would be needed to determine if connections like those made by Mitchell and Erika would have a long-term effect on their CTN.

In Figure 4, Marisa, another participant, drew a scene featuring Indian Great Hornbills (which many participants confused with toucans). In her interview, Marisa was quiet and gave short answers. As an interviewer, I initially interpreted this as being shy or disinterested in the subject matter. However, upon reading her description of her drawing, I learned that Marisa is a native Spanish speaker and wrote an elaborate and detailed expression of her reaction to the episode in her native language. She expressed wonder at observing the “toucans” flying and fighting and her desire to see them in real life. She described having an emotional response to the “beautiful colors” of the birds and her interest in learning more about them. This experience with Marisa was one of the more eye-opening moments in my data collection, recognizing how impactful the imagery was on participants even with a language barrier. Lumber et al. (2017) also described beauty, or aesthetically-pleasing aspects of nature, as another meaningful pathway to nature connection. The beauty displayed in the episode inspired Marisa to go into nature (to

see toucans/Indian Great Hornbills). An indirect experience inspired her to seek more direct nature experiences, which could help to increase her CTN.

Evoking Emotions

While each participant described an emotional response to the episode either in their written description or their interview, only three participants specifically drew their emotional response. Figures 5, 6, and 7 are drawings completed by Sarah, Brittany, and Elizabeth showing the emotions that arose in them while viewing the *Our Planet* episode:

(Above, L to R)

Figure 5. *Sarah's drawing,* ***Figure 6.*** *Elizabeth's drawing, and* ***Figure 7.*** *Brittany's drawing*

In Figure 5, Sarah depicted her overall emotional response to the episode as "joyful." She used different colors and a key to describe the other emotions she felt during the viewing, including happiness, compassion, anger, sadness, interest, "earthy"-ness, and "crying." She elaborated in her written description and interview to say that watching nature shows makes her happy, and she enjoyed watching the episode, but "I was angry 'cause I don't like when animals eat each

other… then I was crying, at one point I had a little tear in my eye… when the birds were fighting." Despite the emotional rollercoaster that Sarah was on throughout the episode, she still found herself arriving at joy as her main emotional response.

Figure 6 shows Elizabeth's drawing, who had a similar emotional response to Sarah's: "happy." Elizabeth explained that she drew flowers in her picture because there were lots of exotic plants shown in the episode, and she wrote the word "happy" because "I felt happy the whole time I was watching." Baur et al. (2019) found that positive emotions/attitudes towards nature are positively correlated with pro-conservation behaviors. Emotion is one of the five pathways to nature connection described by Lumber et al. (2017), and with these participants it's clear that emotional responses can impact how a person perceives natural imagery. Sarah and Elizabeth's positive feelings toward nature as a whole (and Sarah's emotional reactions to the more stressful moments in the episode) show potential for developing their CTN and potential adoption of pro-environmental behaviors later in life (Baur et al., 2019; Lumber et al., 2017).

Brittany, however, had a different response. In Figure 6, Brittany's drawing shows her overall emotional reaction to the episode: "uncomfortable." In her written description and her interview, Brittany explained that "I drew it because the mating tree part made me uncomfortable. I didn't like how it showed the animal's business. I loved the lesson besides that part." Brittany is referring to a scene in the latter half of the episode showing male fossa's competing for a female, who is sitting in a "mating tree" and waiting for males to court her. While observing participants watching the episode, this scene generated the most laughter and visible discomfort among them. When asked about her feelings toward nature, Brittany said nature makes her feel happy and peaceful, but many of the scenes in the episode made her sad because "the forest they showed us is gone now." While the episode overall resonated with

Brittany, she (and a few others) seemed distracted by the humor and discomfort they experienced during their viewing over their positive emotional response. It's possible that, due to the rapid physical changes and social development that occur throughout adolescence, documentaries featuring long scenes related to mating could hinder or prevent the development of CTN in some members of this population.

Human/Nature Interaction

The final theme that was present among participant drawings is human/nature interactions. The three participants that created these pieces of art drew explicit connections between human influence and the issues faced by the animals in the documentary.

(Above, L to R)

Figure 8. *Caroline's drawing,* ***Figure 9.*** *Taylor's drawing, and* ***Figure 10.*** *Kat's drawing*

Caroline's artwork, Figure 10, features several scenes from the episode. From top to bottom: a mating pair of rough-skinned newts (also referred to as salamanders), lemurs (also referred to as monkeys) sitting in a tree, the "abandoned city", and the aforementioned "eagle fight." Caroline drew several animals in her art piece, but in her interview and written

description largely focused on the "abandoned city", also known as Chernobyl. The *Our Planet* episode describes the 1986 Chernobyl nuclear disaster and how it resulted in leaving a large area of land around the power plant uninhabitable for the foreseeable future. This has allowed plants and greenery to overwhelm the abandoned buildings. Relatively recently, Chernobyl has seen the return of wild animals, including predators like wolves, indicating that in the absence of human interference, it is possible for nature to thrive (Our Planet, n.d.). While Caroline featured several animals in her drawing, her focus on Chernobyl is what led to her drawing being categorized as "human/nature interaction." Caroline's written description describes each of the animals that she drew, and she elaborates on her depiction of Chernobyl by saying she "drew the abandoned city because it was cool that lots of vegetation grew in a little… time." In her interview, Caroline was rather taciturn in her responses to the interview questions. This could be due to a number of factors: shyness, discomfort with the other participants in her small group, etc. She elaborated slightly on her feelings about the episode, saying she felt "amazed" when she saw the abandoned city and all of the non-human life it supported.

Figure 9 shows a drawing by Taylor, a participant who also found the images of Chernobyl in the episode to be particularly impactful. In his written description and interview, Taylor described that he "like[s] places that have been left or abandoned. I thought that the animals that moved were smart." While Taylor said nature makes him happy, he described feeling neutral after watching the *Our Planet* episode. Several participants described conflicted emotions between their feelings toward nature and how the episode made them feel. Often, they said nature made them feel peaceful or happy. The episode, however, made some feel sad, angry, or upset about some the revelations within the episode. The ending of the episode reveals that the places and animals that participants just watched were in danger or, in some cases, no longer

existed. While the uncomfortable feelings some participants described may act as a motivating factor to protect wild places for some, there is also the possibility that participants who felt this way could become somewhat paralyzed in their development of CTN. When a problem feels too big to be solved, such as climate change, disengagement can be a protective emotional response (Andre, 2016). For adolescents in particular, who are going through intense stages of physical, social, and mental development, extending this extra energy could be too much for them to bear.

In Figure 10, Kat takes a more direct approach to illustrate how humans have impacted the natural world. In her drawing, Kat depicts three people watching the *Our Planet* episode on a screen with the caption "Humans destroy Earth." She drew herself as one of the people saying "dumb humans", and included an additional sketch showing that her favorite part of the episode was the "cute dogs" (African wild dogs). Of all of the participants, Kat was the most direct in her association of humans with her perceived plight of the natural world. In her written description, Kat said "a lot of Earth's animals are endangered because of humans. I basically wish we could not hurt all the plants and animals on Earth." In her interview, Kat said the episode made her "sad and mad" because "humans are always polluting and destroying the Earth, and so many things are endangered." Kat connected to nature in both meaning and compassion, two of Lumber et al.'s nature connection pathways (2017). Panno et al. (2021) found that moral anger can be a powerful motivating factor towards climate activism and pro-environmental behaviors in adults. As little research has been done on this topic with adolescents, it is possible that Kat's feelings of anger could be channeled into pro-environmental behaviors, potentially increasing CTN (Bandura & Cherry, 2020; Panno et al., 2021).

Implications for Educators

The data generated during this study could have implications and applications for educators. Most participants within this study had a notable emotional response to viewing the *Our Planet* episode, showing there could be potential for television (or other "indoor" activities) to impact CTN in adolescents. For educators who lack access to outdoor learning spaces, nature documentaries could be a promising means of encouraging youth to build their own CTN without having to step outside. With just an internet connection and a projector, educators could expose children to the outdoors when a traditional outdoor experience may not be possible. As accessibility to safe outdoor spaces is an issue for so many, "indoor" nature experiences could be a lifeline for young people to bond to the natural world and, potentially, grow to protect it.

Limitations

There were several limitations to this study. One limitation would be the short time duration that participants engaged with the nature documentary. There is potential that a more powerful impact could be made if participants viewed the entire *Our Planet* series instead of just one episode. Another possible limitation could be the choice of sampling site. Summit Charter School purposely incorporates outdoor education into their curriculum, therefore participants in this study were more likely to already have a strong CTN due to their repeated exposure to the outdoors. An initial high level of CTN could result in little change after watching the episode.

Conclusion

With the importance of connection to nature in the development of pro-environmental behaviors well established throughout this paper, it is imperative that outdoor educators examine every avenue of building CTN in youth to help protect the environment we live and work in. There is little in-depth research currently regarding how indirect or "indoor" nature experiences can impact CTN in adolescents, but there are so many potential directions that future studies

could take. First and foremost, a longitudinal study following adolescent participants into adulthood to observe whether a lasting impact on CTN can be made through watching nature documentaries. Without determining if a lasting impact can be made on adolescents' CTN, it is difficult to determine how powerful a nature documentary can be as a treatment. Similarly, observing the difference in CTN between participants who engage in a direct "outdoor" nature activity (e.g., going on a hike) and participants who engage in an indirect "indoor" nature activity (e.g., watching a nature documentary) could help illuminate the differences in CTN development between direct and indirect nature experiences. There is also potential for exploring the biological impacts of watching a nature documentary on participants as compared to a traditional nature experience. Do people experience the same physiological benefits of being outdoors when they are viewing natural imagery while indoors? There is potential for several different avenues within this realm of research.

For youth who lack access to the outdoors, whether due to safety, access, illness, or other barriers, this research could profoundly impact their ability to connect with nature. While traditional outdoor experiences are considered superior in current research, there is not enough study on the impacts of indirect experiences, and the use of digital technology and nature documentaries specifically, to rule out "indoor" experiences entirely as a means of developing CTN. As this study has shown, youth can have profound emotional responses to nature, even when it is merely presented on a screen. It would be irresponsible to rule out digital technology's role in outdoor education without exploring the many avenues that could benefit youth and the world at large.

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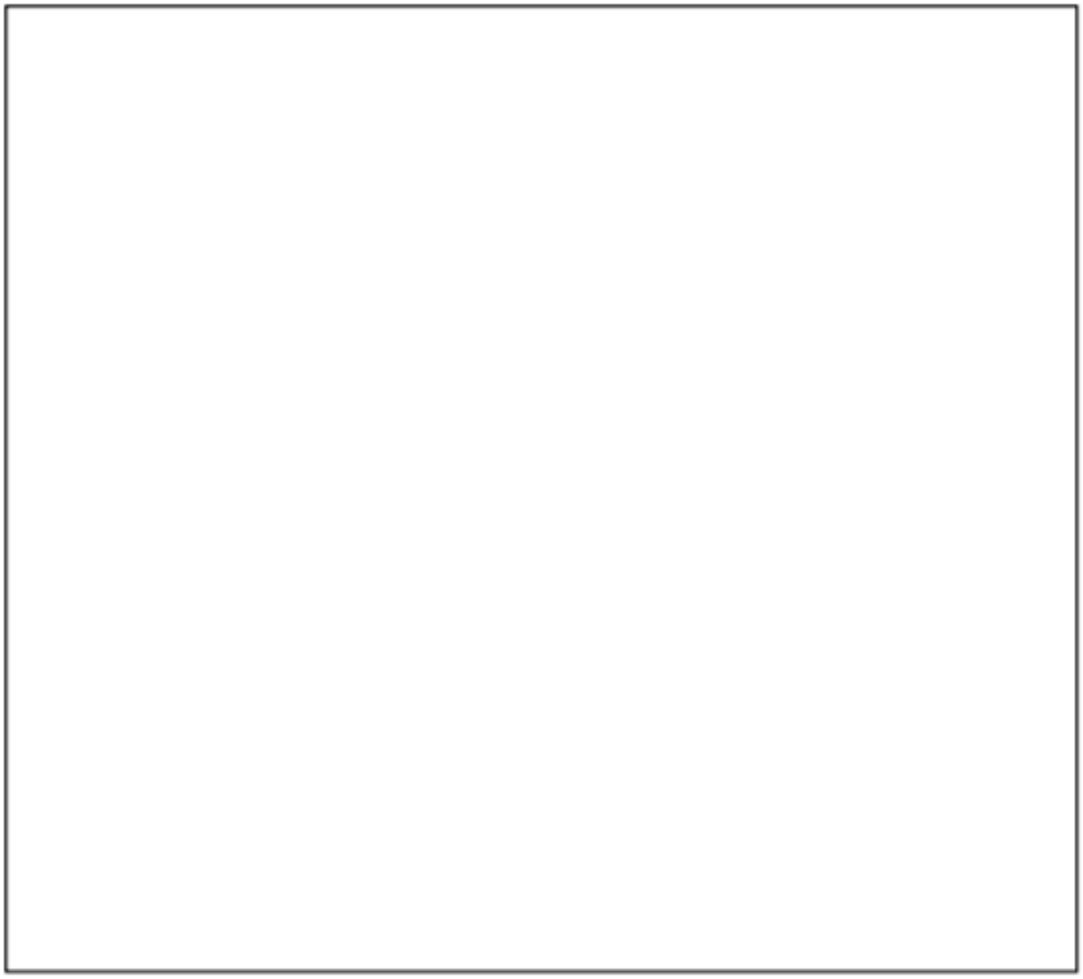
APPENDIX A: DRAW, WRITE, TELL HANDOUT

Use the space below to create a piece of art that describes how the episode of *Our Planet* made you feel about nature:



Please write a few sentences below describing what you drew and why (feel free to use the back of the page if you need to!):

APPENDIX B: INTERVIEW GUIDE

Interview Guide

Introduction

1. What is your name?
2. How old are you?
3. When I say "nature", what does that make you think of?

Drawings

1. Will you tell me about your drawing?
2. How does your drawing show how you feel about nature?

Our Planet Episode

1. How did the video we watched make you feel?
2. What was your favorite part of the video we watched?
3. Do you like watching shows about nature? Why?

APPENDIX C: REVISED CONNECTION TO NATURE INDEX SURVEY

Name: _____ Age: _____

Gender: _____ Race: _____

How much do you like to see or do the following things? Please mark ONE circle for each line.

Experiences	**Do not like at all** ○				**Like very much** ○
See plants and flowers in nature	○	○	○	○	○
See wild animals living in a clean environment	○	○	○	○	○
Take care of animals and plants	○	○	○	○	○
Touch animals and plants	○	○	○	○	○
Love and care for nature	○	○	○	○	○
Go outside and enjoy nature	○	○	○	○	○
Learn more about nature	○	○	○	○	○
Collect rocks/shells/leaves in nature	○	○	○	○	○
Hear different sounds when I am in nature	○	○	○	○	○
Grow vegetables and plants	○	○	○	○	○
Be in the outdoors	○	○	○	○	○
Live with plants and animals	○	○	○	○	○
Consider myself as part of nature	○	○	○	○	○
Feel comfortable and peaceful in nature	○	○	○	○	○

Source: Revised by Judith Chen-Hsuan Cheng and Julie Whitburn from Cheng, J.C. & Monroe, M. C., (2012). Connection to nature: Children's affective attitude toward nature. *Environment and Behavior*, 44., and used with permission.

This tool was developed and validated in English.