

**The Impact of Time Outdoors on Pro-Environmental Behaviours as a Function of Child
and Teacher Connectedness to Nature**

Luka Dellavia

Word Count: 9,167

*This thesis is submitted in partial fulfilment of the Honours degree of Bachelor of Psychological
Science (Honours)*

Table of Contents

List of Figures.....	4
List of Tables.....	5
Abstract.....	6
Declaration.....	7
Contribution Statement.....	8
Acknowledgment.....	9
Introduction.....	Error! Bookmark not defined.
Background.....	10
The Importance of Childhood Experiences.....	11
Connectedness to Nature.....	13
Time Spent in Nature	15
Pro-Environmental Behaviours.....	18
The Current Study	19
Method	21
Participants	21
Procedure	22
Measures.....	22
Socio-Economic Conditions	23
Teacher Connectedness to Nature Scale	23
Connection to Nature Index.....	23

Time in Nature and Pro-Environmental Behaviours.....	24
Ethical Considerations	25
Statistical Analysis.....	26
Results	27
Descriptive Statistics.....	27
Correlations Between Variables.....	28
Testing the Mediation Model.....	30
Testing the Moderated Mediation Relationship	32
Discussion.....	35
Summary of Findings	35
Implications.....	40
Limitations and Future Research	42
Conclusion	44
References	46
Appendix 1: Student Survey Questions	58
Appendix 2: Connection to Nature Index.....	60

List of Figures

<i>Figure 1.</i> The proposed mediation model	20
<i>Figure 2.</i> The proposed moderated mediation model	20
<i>Figure 3.</i> Total direct and indirect effects of time in nature on pro-environmental behaviours ...	32
<i>Figure 4.</i> Indirect effects of time in nature on pro-environmental behaviours when including moderator variable	34

List of Tables

Table 1. <i>Means and standard deviations of variables in the mediation analysis</i>	27
Table 2. <i>Means and standard deviations of variables in the moderated mediation analysis</i>	28
Table 3. <i>Correlations between variables for the mediation analysis</i>	29
Table 4. <i>Correlations between variables for the moderated mediation analysis</i>	30
Table 5. <i>Model coefficients for the mediation analysis</i>	31
Table 6. <i>The effect of teacher connectedness to nature on student connectedness to nature</i>	33

Abstract

Amongst children, spending time in nature plays an important role in establishing a desire to protect the environment, however may be dependent on the development of a connection towards the nature they spend time in. As a result of increased urbanisation, children are becoming increasingly distant from nature—both physically and cognitively. Therefore, future global conservation may be reliant on children forming meaningful connections to nature as a result of outdoor engagement. Given the importance of early role models, and extensive time spent in educational settings, teachers may also play an important part in developing this connection to nature in children. Using survey responses from 352 Australian primary school students, mediation analysis was used to determine if nature connection is an underlying mechanism in the relationship between spending time outdoors and pro-environmental behaviours. Further, within a sub-sample of 62 students and 44 teachers, we explored whether the level of teacher nature connectedness acts as a moderator of this mediation relationship. The results showed that developing a connection to nature partially mediated a relationship between spending time in nature and pro-environmental behaviours. Despite teacher nature connection predicting child connectedness, the smaller model was not able to replicate the initial mediation pathway. Early connection to nature as a consequence of time spent outdoors appears to play an important role in promoting pro-environmental behaviour in children. These results have important implications for global conservation, and suggest that the education setting may provide a convenient context for meaningful nature experiences to be fostered.

Keywords: nature, connectedness, pro-environmental behaviours, environment.

Declaration

This thesis contains no material which has been accepted for the award of any other degree of diploma in any University, and, to the best of my knowledge, this thesis contains no material previously published except where due reference is made. I give permission for the digital version of this thesis to be made available on the web, via the University of Adelaide's digital thesis repository, the Library Search and through web search engines, unless permission has been granted by the School to restrict access for a period of time.

Signed

Luka Dellavia

September 2021

Contribution Statement

Before the commencement of this thesis, data was already being collected under the direction of my supervisor and in collaboration with Resilient Youth Australia. Ethics approval had already been granted for this study prior to my commencement on the project. I worked together with my supervisor to produce a suitable research question and to decide on appropriate methodology and statistical analysis. The broader measures available were decided on and constructed by my supervisor in conjunction with Resilient Youth Australia, however I selected the variables relevant to my research question, extracted raw data and scored items used in this thesis. The methods and statistical analyses were conducted by myself, under guidance from my supervisor. I performed the literature search and collation of evidence, and wrote up all parts of the thesis.

Acknowledgments

First and foremost, I would like to thank my supervisor, Dr Mark Kohler for the opportunity to work on this project and for his calm reassuring guidance along the way. I am eternally grateful for your feedback and support, without which I would not have been able to complete this thesis. It has been a pleasure to learn from you and I take with me a renewed sense of curiosity and wonder for the natural world. To my partner and my family, thank you for being patient and supportive of all my endeavours. Your words of encouragement have helped me get through this tough year with confidence and a smile on my face. Lastly, I would like to thank the University of Adelaide and all the brilliant staff for providing students with the best opportunities, it was a privilege and an utter delight to do my fourth year of studies here.

The Impact of Time Outdoors on Pro-Environmental Behaviours as a Function of Child and Teacher Connectedness to Nature

Background

According to data collected by the United Nations Population Division (2020), more than half (55%) of the earth's population live in urban areas—a number that is expected to increase with population growth. As a result of urbanisation, people are spending less time in nature, with estimates suggesting the average person spends around 90% of their time indoors (Klepeis et al., 2001). Unfortunately, this trend appears to be more apparent for today's children who spend less time outdoors than their parents did (Clements, 2004; Soga & Gaston, 2016). An anthropocentric view suggests humans are the most important living thing on the planet and nature is simply a resource to further human development (Karataş, 2016). This notion only serves to encourage the idea that nature is a resource that serves human development, driving a sense of disconnect from the natural world (Frantz et al., 2005; Kidner, 2001). As a consequence, humans are the main contributing factor to continuing environmental degradation—particularly within the last 50 years. We have now had a significant impact on 75% of the world's land surface and 66% of the ocean, which has led to an overwhelming decline in biodiversity and natural ecosystems (IPBES, 2019). However, in order to support the current rate of development without exhausting natural resources, humans require a fundamental shift in attitude towards a more eco-centric mind-set, where all aspects of the environment are deemed to have value and none is more important than the other (Folke et al., 2011; Karataş, 2016; Steffen et al., 2011). The term “extinction of experience” used by Robert Pyle (2003) describes how physical distance from nature can lead to increasing emotional and cognitive disconnect. Therefore, it is important to be aware of avenues to increase positive ecological attitudes and behaviours in order to promote sustainability.

Studies have confirmed that spending time in and connecting to nature is critical for developing positive attitudes and concern for the environment and is also a predictor of pro-environmental behaviours (Brehm et al., 2013; Soga & Gaston, 2016; Vaske & Kobrin, 2001; Whitburn et al., 2019). Pro-environmental behaviour refers to any action that aims to reduce an individual's negative impact on the environment (Kollmuss & Agyeman, 2002). Louv (2005) uses the term “nature-deficit disorder”, not as a clinically diagnosable medical condition, but as a name for the growing gap between young people and the environment. Louv's concern is for the future of conservation—if children have no connection to nature, we face the decline of future environmental awareness and sustainable behaviours. The challenge we face now is how to create an underlying connection to nature in children which will lead to more pro-environmental behaviours.

The Importance of Childhood Experiences

As the future of environmental sustainability, it is important to understand what connects children to nature and how we can better integrate this into the education system. There is evidence that points to the importance of childhood experiences in developing ecological attitudes. For example, adults with pro-environmental attitudes and behaviours were more likely to have participated in activities such as camping or hiking before the age of 11 (Wells & Lekies, 2006). Similarly, programs aimed to increase affinity for nature have consistently been more successful in doing so with younger participants (Ernst & Theimer, 2011; Leifländer et al., 2013). People who have chosen to work in the outdoor industry report an adult in their life who acted as a ‘catalyst’ and inspired their love of nature as a child (Huynh & Torquati, 2019). Similarly, Chawla (2007) found that environmentalists listed childhood experiences and role models as significant influences on their environmental attitudes. Chawla determined that

significant adults, such as parents and teachers, encourage children's interest in several ways: showing care for nature, discouraging poor environmental behaviour, and through their own enjoyment and interest in nature. This supports Bandura's (1977) social learning theory which suggests that modelling is an effective way of teaching children who observe behaviours and attitudes of an older individual. Kharod and Arreguín-Anderson (2018) observed that children's affinity to nature can be mediated by other children and adults who demonstrate curiosity and care for the environment. Their study followed the journey of a pre-schooler named Ava as she moved from initially fearful reactions to nature to a more caring and curious enjoyment of nature. By witnessing others display wonder and empathy for nature children can learn to enjoy, be empathetic and develop a connection to nature, even with little prior experience in nature (Kharod & Arreguín-Anderson, 2018).

For many young people, either parent interest in outdoor experiences is low or their parents do not have the time to spend outdoors with them, and so experiences in childhood instead come from teachers or involvement in groups like Scouts (Clements, 2004; Lovelock et al., 2016; McFarland et al., 2014). Sociocultural factors also influence parents' attitudes towards their child's time in nature, for example Danish parents are more likely to emphasise the importance of nature and encourage their kids to spend more time in nature than American parents (Vandermaas-Peeler et al., 2019). Children spend a significant amount of their childhood at school—roughly 11,000 hours of primary and secondary school for Australian children (OECD, 2019). Yet there is little research about the relationship between teacher's attitudes and student's connection to nature considering this critical time for developing positive environmental attitudes and behaviours (Chawla, 2007; Wells & Lekies, 2006). We do know that having a role model can influence responsible behaviours and lead to more positive academic

outcomes (Stern et al., 2018), and that active teacher engagement can increase student interest in environmental issues (Stern et al., 2008). Teachers can also positively influence important factors for success such as self-efficacy and increase goal directed thinking amongst their students by providing a safe and supportive environment (Blazar & Kraft, 2017; Pianta & Hamre, 2009). However, when it comes to environmental education and spending time outdoors, many teachers base the decision to incorporate these activities into their curriculum based on their own experiences and attitudes (Bilton, 2020). If teachers have previous positive experiences in nature from their own childhood and have developed a strong connection to nature, then as teachers their behaviour is likely to be reflective of these values. Therefore, given the importance of role models on developing children's attitudes towards pro-environmental behaviours, we see a unique opportunity to explore if teacher attitudes to nature translate into an increase in the level of their students' connectedness to nature. This is an important interaction to explore because if teachers are shown to have a meaningful influence over their student's connection to nature then this may be a significant opportunity to help foster and develop children's positive environmental attitudes and behaviours.

Connectedness to Nature

Connectedness to nature has been defined as “the extent to which an individual includes nature within his/her cognitive representation of self” (Schultz, 2002, p. 67). Connectedness to nature encompasses the cognitive, affective and behavioural aspects of an individual's nature relatedness or affinity to nature. Here, connectedness to nature is broadly defined as the extent to which an individual's self-schema overlaps with the natural environment. Namely, individuals who include nature as a part of their identity have a self-schema that overlaps with nature (Schultz, 2002). Nature connectedness has been found to predict a range of positive outcomes in

children, including better well-being (Barton et al., 2016; Capaldi et al., 2014; Harvey et al., 2020; Whitten et al., 2018). In addition, there has consistently been a positive relationship found between nature connectedness and pro-environmental behaviours (Tam, 2013). Schultz (2002) uses the three components: connectedness, caring and commitment to explain the relationship between humans and the environment. It is suggested that a commitment to protecting nature cannot occur without a connection to nature, and it can only occur if we truly care about the environment. In this case, caring for the environment refers more to the emotional affinity for nature aspect of connectedness. This is supported by Ives et al. (2018) who suggest that both cognitive (inner) connections and experience (outer) connections are required if transformative change is to occur. Giusti et al. (2018) best describes this relationship as being *in* nature (comfort and curiosity), being *with* nature (education and time in nature) and being *for* nature (pro-environmental behaviours). As such, for children a connection to nature will only develop over time where they first feel a sense of comfort from being in nature which then grows to a general curiosity about nature (Giusti et al., 2018). Only after they have developed their sense of being *in* and *with* nature can they start to develop a desire to be *for* nature. As such, connectedness to nature is the fundamental underlying mechanism, acting as a catalyst for the development of environmentally sustainable behaviours as a result of spending time in and enjoying nature.

The biophilia hypothesis claims that well-being improves as we strengthen our connection to nature because humans have an innate desire to connect with nature—a remnant of an evolutionary need to understand the environment for survival (Kellert & Wilson, 1993). Given the evolutionary propensity towards an affinity for nature and its importance in committing to care for the environment, nature connectedness is likely to be an integral part of developing a more eco-centric view of the world. Therefore, it is important to understand how we can utilise

this to encourage more positive environmental attitudes and behaviours. Sensory nature experiences are an important part of the development of a connection to nature because they aid in the development of long-lasting memories (Beery & Jørgensen, 2018), which may play an important part in inciting environmental epiphanies. Environmental epiphanies are described as an intense and meaningful emotional experience in nature, and could play a role in the emergence of nature connection by creating a fundamental shift in the meaning of an individual's relationship to nature (Vining & Merrick, 2012). We know that many environmentalists list important childhood experiences as one of the most significant influences on their affinity for nature (Chawla, 1999; 2007). However, these studies use retrospective accounts of childhood nature experiences and therefore cannot determine if the events are what led to a strong connection to nature or if these events are simply salient memories that the participants attribute the development of their passion for nature to. Consequently, the same could then be said for environmental epiphanies—do children really experience them or are salient nature experiences misconstrued as environment epiphanies in adulthood? Nevertheless, there appears to be a strong link between nature experiences and creating impactful memories. Therefore, if we are to see a profound shift in the way young people view nature, we need to allow them to spend time in nature in order to create opportunities for them to have meaningful experiences and develop a connection to nature.

Time Spent in Nature

Exposure to nature increases connectedness to nature. For children, taking part in hands on nature activities results in more empathy and concern for nature, leading to an overall increase in connectedness to nature (Barthel et al., 2018). There are several possible explanations for the benefits of direct experience in nature over indirect. Children can apply and develop their

environmental knowledge through hands on exploration, and they can take time to become more at ease within their surroundings (Kharod & Arreguín-Anderson, 2018). A successful ‘hands on’ program in Sweden that has proven long term effects is the Salamander Project, where groups of students save salamanders and learn about conservation issues affecting them (Barthel et al., 2018). There appears to be two main reasons for the success of this program. First, the children reported a sense of responsibility and pride from looking after the species. Second, they enjoyed being part of an important project which strengthened their connection, empathy and concern for nature (Barthel et al., 2018). Environmental education programs more broadly have also been shown to be effective tools for increasing connectedness to nature in primary school aged students (Ernst & Theimer, 2011). However, in order for these programs to lead to meaningful nature experiences for children they should be thought provoking, entertaining and inspiring to encourage children’s natural curiosity (Giusti et al., 2018).

Children do not necessarily have to spend time directly interacting with nature to form connectedness. Learning about nature within a classroom has also been shown to have positive effects (Ernst & Theimer, 2011). Similarly, a creative art contest where students were encouraged to use nature as inspiration proved to increase implicit connectedness to nature (Bruni et al., 2017). One advantage of this approach is that by using implicit tests researchers can better avoid social desirability bias which can potentially influence participant responses. Similarly, spending time in a natural history museum was shown to increase implicit nature connectedness, but only for students who did not already have a strong level of connection (Bruni et al., 2018). Despite such effects for indirect nature interaction, the positive impact of affect and nature connectedness appears to be greatest for those who spend time directly in nature (Mayer et al., 2009). Indeed, some indirect nature experiences, such as watching a nature documentary, have been found to be

insufficiently engaging to increase individual's connectedness to nature (Arendt & Matthes, 2016).

The timing of engagement is also important. Experience before age 11 is again posited to be a critical time for longer lasting and more impactful experiences to develop and foster a connection to nature (Leifländer et al., 2013; Wells & Lekies, 2006). Harvey et al. (2020) showed that increases in connectedness to nature and positive affect can be sustained over the school year with regular education sessions. Time spent in nature during childhood appears to nurture a sense of connectedness to the environment that endures throughout childhood and into adulthood (Ewert et al., 2005; Huynh & Torquati, 2019; Rosa et al., 2019; Soga & Gaston, 2016). Further, time spent in nature-based activities as a child is related to a higher sense of environmental stewardship and in turn, is more likely to result in pro-environmental behaviours in adulthood (Asah et al., 2018; Chawla, 2007). If significant and meaningful nature experiences occur before the age of 11 it is more likely that they will have a more profound influence over future environmental attitudes (Wells & Lekies, 2006). However, connection to nature requires more than one or two emotionally significant experiences in nature to develop; rather it is the summation of multiple experiences and exposure to the attitudes of others (Molinario et al., 2020). Additionally, sensory rich, hands on learning experiences seem to have particularly strong effects on children's enjoyment of nature in developing empathy and a sense of stewardship for the environment (Barthel et al., 2018).

Overall, it appears that early active engagement, participation and enjoyment with programs, whether directly or indirectly interacting with nature, are the crucial factors for increasing children's connectedness to nature (Ernst & Theimer, 2011; Harvey et al., 2020; Mayer et al., 2009). While nature connectedness may provide a number of direct benefits to the

individual, how it might promote pro-environmental behaviour is an important further consideration in an attempt to both conserve and promote care for nature.

Pro-Environmental Behaviours

The connection to nature that extends from spending time interacting with it is associated with a desire to also protect nature (Whitburn et al., 2019). In other words, because of the formation of a connection with nature, there is a sense of stewardship and a desire to conserve and protect—a factor that should not be overlooked for future environmental conservation efforts. Indeed, the connection formed through spending time in nature, and possibly the specific place meaning that develops as part of a connection to nature, are shown to predict sustainable behaviours (Brehm et al., 2013; Vaske & Kobrin, 2001). Brehm et al. (2013, p. 533) concluded that people are more likely to protect places of meaning to them due to the ‘inclusion of self and nature rather than just an emotional response’, showing the importance of both the cognitive and emotional aspects of individual connection to nature (Schulz, 2002). Similarly, Identity Theory suggests that behaviour is guided by meanings within one’s identity of self (Stets & Biga, 2003). The same theory also proposes a feedback loop where an individual’s sense of self can be reinforced from the feedback that they receive from others. If this is the case, children’s nature connectedness and their view of themselves within nature may be strengthened by role models, particularly if the role model has an affinity for nature and provides positive reinforcement (Chawla, 2007). The combination of experience, affect and role models has been proposed to “precondition” pro-environmental attitudes and actions in adulthood (Ewert et al., 2005). Further, environmental attitudes, values and behaviours are consolidated during mid-late childhood or otherwise experience a sharp decline in later adolescent years (Otto et al., 2019). Given this, it is

all the more important to develop positive attitudes towards environmentally sustainable behaviours from an early age.

A final consideration with regards to the impact of time in nature on pro-environmental behaviour concerns the duration of experiences. Shwartz et al. (2012) found that shorter participation in nature activities can increase knowledge and awareness but not necessarily lead to environmental actions. Other studies have found that extended time spent in and learning about nature can lead to more pro-environmental behaviours (Collado et al., 2013; Martin et al., 2020). Further, there is evidence that nature experiences that last for several days lead to greater conservation intentions in children (Collado et al., 2013; Stern et al., 2008). Despite a possible effect of duration, many children feel that even with a developed desire to protect the environment they still do not engage in pro-environmental behaviours or feel that if they did it would not make a meaningful difference (Fien et al., 2002). As such, it remains important to investigate the factors which best ensure experience in nature translates into enduring environmental attitudes and effective environmental behaviour.

The Current Study

Taken together, time in nature, children's connection to nature and teacher connectedness to nature all play an important part in promoting sustainable actions, however their influence over the environmentally sustainable actions of children is not clear. Therefore, the current study has two main aims: (1) to explore whether children's connectedness to nature mediates the relationship between amount of time spent in nature and pro-environmental behaviours; (2) to determine if teacher connectedness to nature emerges as a moderator of the mediation relationship between time in nature and pro-environmental behaviours. We propose two models to demonstrate this relationship—a mediation model (see Figure 1) where time spend in nature

(X) leads to pro-environmental behaviours (Y) as a result of children’s increased connection to nature (M), and a moderated mediation model (see Figure 2) where the mediation relationship is moderated by teacher connectedness to nature (W). Therefore, we propose the following hypotheses. Time spent in nature will be positively associated with children’s connectedness to nature ($H1$). Children’s connectedness to nature will be positively associated with pro-environmental behaviours (PEB) ($H2$). The relationship between time in nature and pro-environmental behaviours will be partially mediated by level of children’s nature connectedness ($H3$). Teacher connectedness to nature will moderate the mediation of time in nature on pro-environmental behaviour by a child’s connection to nature. Specifically, higher levels of teacher connectedness to nature will act to strengthen the children’s connection to nature ($H4$).

Figure 1

The proposed mediation model

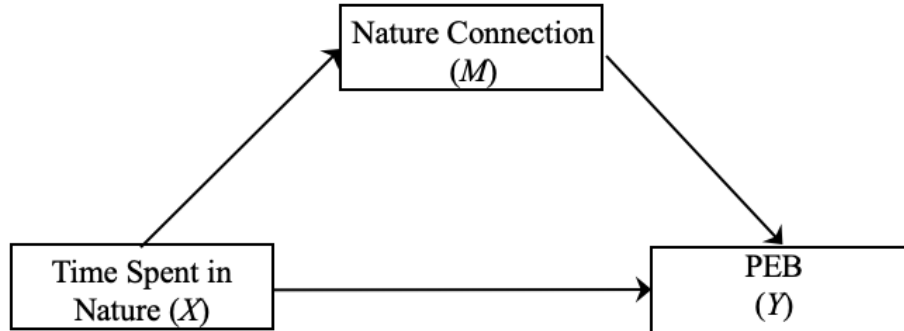
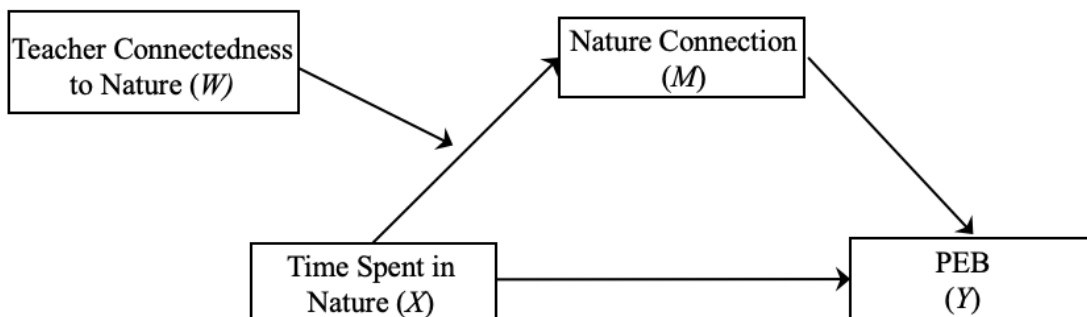


Figure 2

The proposed moderated mediation model



Method

Participants

Based on effects reported for the association between nature connectedness and pro-environmental behaviours in Australian children (Keith et al., 2021), power analysis using G*Power (Erdfelder, Faul and Buchner, 1996) suggested a sample of 31-68 children would be adequate to detect a medium ($d = 0.5$) to large ($d = 0.8$) effect using the two predictor variables in the planned mediation analysis, power = 0.8, alpha = 0.05. The estimated sample for a model with three predictors was 36-77 in order to detect a medium to large effect in the moderated mediation analysis.

A total of 367 students completed the survey. Two participants did not complete the entire survey so were excluded from the final sample and 13 were excluded as they fell outside the age range for the study (4-12 years). The final sample consisted of 352 participants (167 Males, 181 Females and 4 who preferred not to say) with an age range of 4–12 years ($M = 7.63$, $SD = 2.16$). Within this sample, 247 (70%) of the participants were from lower primary (kindergarten – grade 3) and 105 (29.7%) from upper primary (grade 4 to grade 6). The final sample included participants from New South Wales (13.1%), Northern Territory (1.1%), Queensland (15.3%), South Australia (49.1%), Tasmania (2.8%), Victoria (14.2%) and Western Australia (4.3%). Students came from around 163 different public schools, private schools, Montessori schools and home schools.

For the secondary analysis, we collected responses from 66 teachers however 22 were excluded as there was no corresponding student survey responses. For this sub-sample a further two of the students were excluded as they fell outside of the age range. The final sample consisted of 44 teachers (100% female) with corresponding responses from 62 students (33

females, 28 males and 1 who preferred not to say) with an age range of 4-12 years ($M = 6.77$, $SD = 2.23$). In this sample, 53 (85.5%) of the students were from lower primary and 9 (14.5%) from upper primary. This sample included participants from New South Wales (21%), Northern Territory (4.8%), Queensland (30.6%), Victoria (41.9%) and Western Australia (1.6%). There was no survey data from teachers with corresponding student data from South Australia or Tasmania in this sub-sample.

Procedure

In 2020 approximately 4000 resource boxes were sent to schools around Australia as part of the Jane Goodall Institute Australia (JGIA) Roots and Shoots Resource Box for Schools program. Schools registered online to receive a free resource box which included educational resources for teachers and students about nature and current environmental issues which aimed to promote education for sustainability. Each school received a unique code to access optional surveys and were asked to complete the survey prior to beginning the program and again three weeks after the completion of the program. Due to time restraints the current study utilised preliminary baseline survey data only.

Measures

Two different surveys were sent to each school—one for children and one for the teachers. The survey for children included demographic questions (e.g., age, gender and year level), self-report measures of their connectedness to nature, time spent in nature and their level of engagement in pro-environmental behaviours. The survey for teachers included demographic questions and a measure of their overall level of connectedness to nature. All surveys were completed using a dedicated survey platform (<https://resourceboxsurvey.com.au/>) managed by Resilient Youth Australia. The different measures are described in further detail below.

Socio-Economic Conditions

Socio-economic conditions for the students was measured using the Australian Bureau of Statistics (ABS, 2016) Socio-Economic Indexes for Areas (SEIFA) report. We used the postcode of the student's school to determine their Index of Relative Socio-economic Advantage and Disadvantage (IRSAD) decile. Deciles ranking of IRSAD scores were used in the current study (i.e. ranging from 1-10) where a lower decile indicates greater socio-economic disadvantage, and a higher decile indicates greater advantage.

Teacher Connectedness to Nature Scale

Teacher's level of connectedness to nature (moderator variable) was measured using the Connectedness to Nature Scale (Mayer & Frantz, 2004, $\alpha = .84$). The Connectedness to Nature Scale is a 14-item survey where participants are asked to think about the way you generally feel when answering the questions. The items aim to measure an individual's levels "of feeling of emotionally connectedness to the natural world" (Mayer & Frantz, 2004, p. 503). Questions include items such as "I often feel a sense of oneness with the natural world around me" and "I often feel a kinship with animals and plants". Three items (4, 12 and 14) were reverse coded (e.g., "my personal welfare is independent of the welfare of the natural world"), such that a higher item scores correspond to higher connectedness to nature on all items. In the original survey, there are five possible responses for each question ranging from 1 = strongly disagree to 5 = strongly agree. The current study utilized a 4-point scale survey with the neutral option 3 = neither agree nor disagree option omitted from the survey. Each participants final score was the average of the 14-items where a higher score meant a stronger connection to nature.

Connection to Nature Index

The children's level of connectedness to nature was measured using a questionnaire based on items from the 14-item Connection to Nature Index (CNI) (Cheng & Monroe, 2012, $\alpha = .87$) however the wording of the items was changed to suit the age level and relevancy to the current study. The upper primary students completed a 13-item survey with three possible responses where 1 = hardly ever, 2 = sometimes and 3 = always. These two items "my actions will make the natural world different" and "people do not have the right to change the natural environment" from the CNI were removed because they were deemed to not be conceptually appropriate for the age level of the participants. The lower primary students were given a modified 11-item survey where the response options were simplified to 1 = yes, 2 = sometimes and 3 = no. The two items left out of the lower primary survey were "I feel that I am part of nature" and "I don't think that we can live without plants and animals" due to the perceived conceptual difficulty for young children to understand these concepts. The CNI item "when I feel sad, I like to go outside and enjoy nature" was reworded in a positive tone to "I like playing outside" in order to focus on general feelings and behaviours and to avoid eliciting emotional memories. Other items were reworded to reflect the participant's feelings of themselves rather than their feelings about others (e.g., "humans are part of the natural world" was changed to "I feel that I am part of nature"). A full list of items for both upper and lower primary students, as well as the original CNI items, are provided in Appendix 1 & 2.

Time in Nature and Pro-Environmental Behaviours

The predictor variable (time in nature) and the outcome variable (pro-environmental behaviour) were both measured within the same survey. Both the Children's Connectedness to Nature Scale and the Connection to Nature Index pertain more to cognitive and emotional connections and therefore did not include items relating directly to the amount of time spent in

nature (Cheng & Monroe, 2012; Mayer & Frantz, 2004). Consequently, the items measuring time in nature were customised and worded appropriately to a primary school level of reading and comprehension. The two items related to amount of time spent in nature included “I play outdoors when at home” and “I play outdoors when I’m here” (“here” meaning at school). The survey included 6-items relating to the individual’s sense of responsibility for the environment in terms of their pro-environmental behaviours. The “my actions will make the natural world different”, “picking up trash on the ground can help the environment” and “take care of animals and plants” items from the Connection to Nature Index relate more to an individual’s belief about the effect of their actions (Cheng & Monroe, 2012). Therefore, the items were modified to “I do things to help nature”, “I pick up rubbish” and “I try not to hurt plants and animals” in order to capture explicit behaviours, rather than a belief only. The other three items relating to pro-environmental behaviours were a logical extension of the previous questions including items like “I try not to waste water”. The items were realistic in terms of pro-environmental behaviours available for children and were developed to align with the sustainability priority determined by the Australian Curriculum, Assessment and Reporting Authority (ACARA, 2021). Participants were able to choose from three possible responses ranging from 1 = always to 2 = sometimes and 3 = hardly ever. There was no neutral response option included.

Ethical Considerations

Ethics approval was given by the University of Adelaide’s Human Research Ethics Committee. Passive consent was provided, whereby an information letter was provided to schools to distribute to parents, and parents were able to opt-out of their child responding to the survey. The survey was completely anonymous, and each school was assigned a code required for completion of the survey in order to maintain confidentiality. Participation in the program

was voluntary and was not a condition of schools receiving the resource box. Survey questions were mostly framed in a positive way to assess overall feelings and behaviours in order to avoid feelings of distress. The researchers had no contact with the children and surveys were administered by teachers who similarly chose to participate in the program.

Statistical Analysis

Descriptive statistics were obtained for the sample demographics in the current study using SPSS version 27. For both the mediation analysis and the moderated mediation analysis, the variables of interest are required to have some association which was determined using bivariate Pearson correlation analysis. To test the mediation analysis and the moderated mediation analysis, we utilised the PROCESS macro (version 4) using Models 4 and 7 respectively (Hayes, 2018). A mediation effect is present when a predictor variable's effect on the outcome variable occurs via a mediating variable. For the mediation analysis, time spent in nature was the predictor (X), pro-environmental behaviours the outcome variable (Y) and nature connectedness was the mediator (M). For the moderated mediation analysis teacher connectedness to nature was the moderator variable (W). A 95% bootstrap confidence interval of the indirect effects of the mediation analysis was calculated using 5000 bootstrap samples (Hayes, 2018).

Results

Descriptive Statistics

Means, standard deviations, ranges and medians of the variables and covariates measured in the primary mediation analysis ($N = 365$) are reported in Table 1, and for the moderated mediation analysis ($N = 62$) in Table 2.

Table 1

Means and standard deviations of variables in the mediation analysis

	<i>M</i>	<i>R</i>	<i>SD</i>	<i>Mdn</i>
Time Spent in Nature (TIN)	2.63	2.00	.45	3.00
Children's Connectedness to Nature (CNI)	2.73	2.00	.32	2.82
Pro-Environmental Behaviours (PEB)	2.54	2.00	.41	2.60
IRSAD Decile	6.12	9.00	2.11	7.00
Age	7.63	8.00	2.16	7.00

Note. $N = 352$; M = mean; SD = standard deviation; R = range, Mdn = Median

For the primary analysis, observation of a Q-Q plots suggested a normal distribution for the socio-economic conditions variable (IRSAD), though it centred around a slightly higher than average mean. Time spent in nature (TIN), children's connectedness to nature (CNI) and pro-environmental behaviours (PEB) were found to be negatively skewed. A Box-Cox transformation was used to reduce the skew of each distribution. After data transformation, the skewness and kurtosis for all three variables significantly improved and approach normality: TIN (skewness = -1.022, kurtosis = 0.542), CNI (skewness = -1.431, kurtosis = 1.881) and PEB (skewness = -1.072, kurtosis = 1.344). Following transformation, a greater score was reflective of higher values for each measure.

Table 2*Means and standard deviations of variables in the moderated mediation analysis*

	<i>M</i>	<i>R</i>	<i>SD</i>	<i>Mdn</i>
Time Spent in Nature (TIN)	2.74	2.00	.43	3.00
Children's Connectedness to Nature (CNI)	2.85	1.09	.23	2.92
Pro-Environmental Behaviours (PEB)	2.47	1.80	.43	2.60
Teacher Connection to Nature (TCN)	3.04	1.46	.37	2.88
IRSAD Decile	5.47	9	2.62	5.00
Age	6.77	8	2.23	7.00

Note. *N* = 62; *M* = mean; *SD* = standard deviation; *R* = range, *Mdn* = Median

For the moderated mediation model, a Box-Cox transformation was used to reduce the skewness of TIN (skewness = -1.764, kurtosis = 3.174), CNI (skewness = -2.247, kurtosis = 5.972), PEB (skewness = -1.111, kurtosis = 1.265) and TCN (skewness = 0.715, kurtosis = -0.543). Transformed data significantly improved the distribution for all variables, with teacher connectedness to nature fitting a normal distribution. However, despite the improvement the remaining variables still showed some departure from a Gaussian distribution.

Correlations Between Variables

The bivariate correlations between the variables used in the primary mediation analysis are summarised in Table 3. Participant age was significantly, negatively correlated with both time spent in nature and children's connection to nature, meaning that older students tended to spend less time in nature. Socio-economic conditions was also shown to have a significant negative correlation with connection to nature. Both age and socio-economic conditions were

subsequently added as covariates for the mediation analysis. Importantly for the mediation analysis, pro-environmental behaviours were significantly and positively correlated with connection to nature and time in nature. As predicted, there was also a significant positive correlation between connection to nature and time in nature. The bivariate correlations for three variables in the mediation analysis were of the same direction and of a similar magnitude.

Table 3

Correlations between variables for the mediation analysis

	1	2	3	4	5
1. Age	1.00				
2. Time in Nature (TIN)	-.26**	1.00			
3. Connection to Nature (CNI)	-.18**	.40**	1.00		
4. Pro-Environmental Behaviours (PEB)	.14*	.29**	.46**	1.00	
5. IRSAD Decile	.04	-.09	-.16**	-.05	1.00

Note. * $p < .05$, ** $p < .001$

The bivariate correlations for the variables in the moderated mediation analysis are summarised in Table 4. There was a significant negative correlation between age and time spent in nature meaning that older children tended to spend less time outdoors. Connection to nature was significantly and positively associated with time in nature, and pro-environmental behaviours was significantly and positively associated with both time in nature and connection to nature. Teacher connectedness to nature was positively associated with pro-environmental behaviours, meaning that having a teacher with strong connection to nature was associated with

more environmentally sustainable actions amongst students. Teacher connectedness to nature was also positively associated with socio-economic conditions which could indicate a possible bidirectional relationship between the teachers' level of connection to nature and the amount of accessible greenspace.

Table 4

Correlations between variables for the moderated mediation analysis

	1	2	3	4	5	6
1. Age	1.00					
2. Time in Nature (TIN)	-.33**	1.00				
3. Connection to Nature (CNI)	-.03	.45**	1.00			
4. Pro-Environmental Behaviours (PEB)	.15	.30*	.52**	1.00		
5. Teacher Connection to Nature (TCN)	.10	-.06	.12	.41**	1.00	
6. IRSAD Decile	.04	.20	.16	.18	.28*	1.00

Note. * $p < .05$, ** $p < .001$

Testing the Mediation Model

A simple mediation was conducted using PROCESS model 4 to assess if connection to nature served as a mediator between time in nature and pro-environmental behaviours. Age and socio-economic conditions were included as covariates in this model. The results for this are summarised in Table 5 and Figure 3. Overall, the model was a significant predictor, explaining 28.5% of the variance of pro-environmental behaviours ($F(4, 347) = 34.6, p < .001$). Time in

nature directly and significantly predicted pro-environmental behaviour when excluding the mediator ($B = .34, t(348) = 6.56, p < .001$). The results showed that time in nature is also a significant predictor of the connection to nature ($B = .37, t(348) = 7.26, p < .001$). The evidence supports the proposed model, that time in nature indirectly predicts pro-environmental behaviours via mediation by connection to nature. A bootstrap confidence interval for the indirect effect ($B = 0.160$) based on 5000 bootstrap samples was above zero (95% CI 0.1026, 0.2261). Given that the direct effect of time in nature on pro-environmental behaviours is still significant when including the mediator (95% CI 0.082, 0.281) we can conclude that partial (rather than full) mediation has occurred.

Table 5

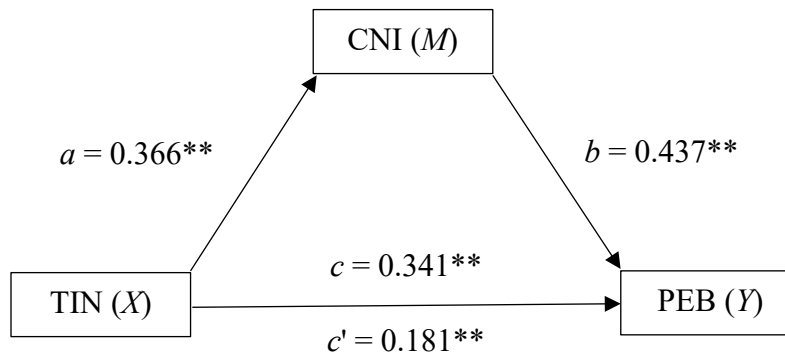
Model coefficients for the mediation analysis

Coeff	M (CNI)			Y (PEB)				
		SE	p	Coeff	SE	p		
X (TIN)	<i>a</i>	.37	.23	< .001	<i>c'</i>	.18	.05	< .001
M (CNI)	-	-	-	<i>b</i>	.44	.05	< .001	< .001
constant	<i>i_M</i>	.64	.23	< .01	<i>i_Y</i>	-1.00	.22	< .001
	$R^2 = 0.18$			$R^2 = 0.29$				
	$F = (3, 348), p < .001$			$F = (4, 347), p < .001$				

Note. $N = 352$

Figure 3

Total direct and indirect effects of time in nature on pro-environmental behaviours. $**p < .001$



Testing the Moderated Mediation Relationship

Within the sub-sample of students ($N = 62$), teacher connectedness to nature was added as a moderating variable to assess how varying levels of teacher connectedness to nature would influence the mediation relationship between time in nature and pro-environmental behaviours via student connection to nature (see Figure 3). The results of the moderated mediation analysis are presented in Figure 4. Overall, the model was a significant predictor, explaining 27.7% of the variance of pro-environmental behaviours ($F(2, 59) = 11.32, p < .001$). Even with the presence of the moderator variable in this analysis, time in nature was still a significant predictor of connection to nature ($B = 1.102, t(58) = 3.95, p < .001$), meaning that more time spent in nature predicts a greater connection to nature. However, the interaction effect was not significant in this model ($B = -0.115, t(58) = -0.449, p = 0.655$) meaning that teacher connection to nature was not found to moderate the relationship. In contrast to the first model, results showed that for the smaller sample the c' path was not significant - that time in nature was not a direct significant predictor of pro-environmental behaviours when connectedness to nature was included in the model ($B = 0.181, t(59) = 0.531, p = 0.531$). However, both the a path ($B = 1.102, t(58) =$

3.951, $p < .001$) and the b path ($B = 0.487$, $t(59) = 3.922$, $p < .001$) of the model remained significant, meaning that more time spent in nature is predictive of a stronger connection to nature, and a stronger connection to nature is in turn predictive of a higher likelihood of engaging in pro-environmental behaviours. Because the indirect path (c') was not significant the current analysis did not replicate the mediation effect that was found in the primary mediation analysis with the larger sample size. Similarly, no moderated mediation was evident given that the confidence intervals cross zero (95% CI -0.268, 0.221). Despite the lack of moderated mediation, teacher connectedness to nature was still found to be a significant predictor of student connectedness to nature at all levels of teacher connectedness (Table 6).

Table 6

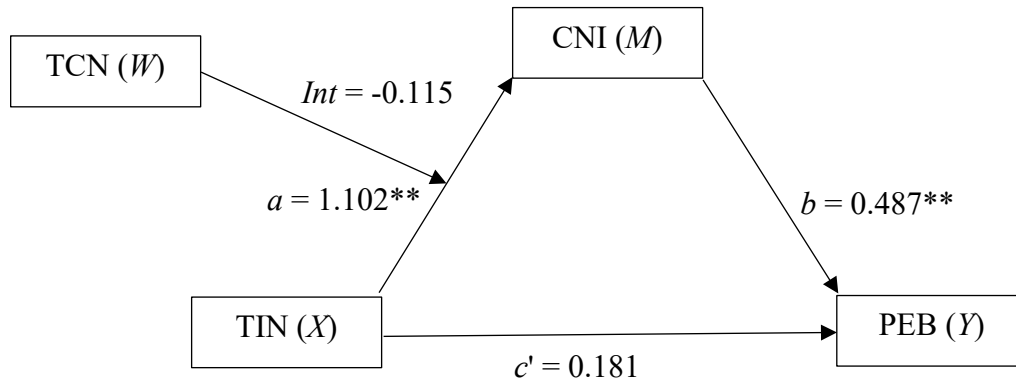
The effect of teacher connectedness to nature on student connectedness to nature

Level of Teacher Connectedness to Nature	Effect	95% Confidence Intervals	
		Lower	Upper
low	0.588	0.174	1.448
average	0.557	0.221	1.382
high	0.468	0.188	1.280

Note. $N = 62$ students and 44 teachers

Figure 4

*Indirect effects of time in nature on pro-environmental behaviours when including moderator variable. ** $p < .001$, * $p < .05$*



Discussion

Summary of Findings

The purpose of this study was to explore the relationship between time children spend in nature, their connectedness to nature, and their pro-environmental behaviours. The secondary purpose was to determine if the level of their teacher's connectedness to nature had any influence on the strength of these relationships. As hypothesised, children who spent more time in nature tended to have a stronger connection to nature. Consistent with our second prediction, children's connectedness to nature was positively correlated with pro-environmental behaviours. Importantly, the results supported our proposed mediation model that the effect of time in nature on pro-environmental behaviours was partially mediated by connection to nature. However, in contrast to our final prediction, whilst the teacher's level of connection to nature was a predictor of student connection to nature, there was no evidence that teacher connectedness moderated the mediation relationship found in children.

The first prediction was that we would see a positive correlation between the children's time spent in nature and their connection to nature. This was supported by the results, from both the full sample and the smaller sub-sample used in the second model, which indicated that the more time a child spends in nature, the stronger their connection to nature tends to be. This is consistent with Giusti et al. (2018) and their notion of being *in* and *for* nature, where children must spend time in nature in order to develop a comfort and curiosity which are the basis for an early connection to nature. Our results are consistent with past literature that has consistently found spending time in nature to be a strong predictor of connection to nature—especially within samples of children under the age of 11 and where time spent involve direct contact with the natural environment (Ernst & Theimer 2011; Giusti et al., 2014; Mayer et al., 2009).

The observed relationship between connection to nature and pro-environmental behaviours supports our prediction and is consistent with the literature that has consistently found connection to nature to be a robust predictor of pro-environmental behaviours (Chawla & Gould, 2020; Giusti 2019; Mackay & Schmitt, 2019). The results also replicate findings from a contextually similar Australian sample of urban primary school children in a very recent study from Keith et al. (2021). It is clear that developing a connection to nature sees the simultaneous development of a care for nature and a desire to protect it. Therefore, having a strong connection to nature is likely to result in more conservation behaviours. The results reflect the three components proposed by Schultz (2002), that we must first be connected to nature so that we then care for nature before we can foster a commitment to protect nature.

Consistent with results from Otto and Pensini (2017), the results from the mediation analysis supported the idea that connection to nature is an important underlying mechanism that facilitates the engagement in pro-environmental behaviours as a result of spending time in nature. The findings emphasise the significance of the interaction between the three variables in developing a sense of stewardship for the environment (Hahn, 2021; Otto & Pensini, 2017). After meaningful experiences in nature, it is perhaps the realisation of the importance of nature and the inclusion of nature within one's self-identity that the desire to protect it arises. Again, the results support Giusti et al. (2018) and their framework that proposes children must first be *in* and *with* nature before they can be *for* nature. This framework was also apparent in the study by Barthel et al., (2018), where children learnt to be curious and comfortable with the salamanders (*in* nature), spent time with and developed their knowledge of the species (*with* nature) and developed a desire to protect the animals (*for* nature).

Research exploring the influence of role models on children's connection to nature has largely focused on parents or other significant adults in the children's lives who have encouraged and inspired their affinity for nature (Chawla & Derr 2012; Stern et al., 2018). However, the current study emphasised the potential importance of the level of connection to nature of teachers and whether this influenced their students' sense of connection to nature. The results suggested that irrespective of level of teacher connection to nature, when students spend more time in nature, they tend to have a stronger emotional affinity to nature. Whilst there was no moderating effect found, teacher connectedness to nature remained a significant predictor of student connection to nature. These findings support suggestions within the literature that significant adults can have a meaningful influence over a child's emotional affinity to nature (Chawla, 1999; Huynh & Torquati, 2019). The smaller sample size in the moderated model was a potential factor in the non-significant findings, as the mediation effect seen in the larger sample was not present within the sub-sample. Another possible explanation is the high mean scores of the children's connectedness to nature that were observed in the sub-sample. This may represent a self-selection bias where teachers opting to complete the survey were from schools with greater nature engagement, and we would consequently not see the full spectrum of the effect of teacher connectedness to nature due to the homogeneity of the sample. However, this may also explain why teacher connectedness to nature was a significant predictor at all levels of children's connectedness to nature – i.e. teachers were modelling positive nature attitudes and behaviours. Despite these potential limitations, we believe that our findings contribute to the importance of recognising the influence that teachers can have on their student's connection to nature and in turn, their ecological behaviours and attitudes.

Contrary to what we might expect, higher socio-economic conditions were negatively associated with time spent in nature. More socio-economically disadvantaged neighbourhoods tend to have less access to public and private green spaces such as parklands and gardens and as a result tend to spend less time in nature (Hunt et al., 2015; Pham et al., 2012). Therefore, we would expect children from higher socio-economic conditions to spend more time in nature than children from more disadvantaged areas. Having access to green spaces is an important factor in encouraging children to engage in nature play in order to develop pro-environmental attitudes and behaviours (Alcock et al., 2020; Beery, 2020; Molinario et al., 2020). However, other evidence suggests that simply living in close proximity to a greenspace may not be as important to pro-environmental behaviours as first thought, rather it is the purposeful action of visiting nature spaces that increases an individual's affinity for nature (Martin et al., 2020). Another potential explanation may be the high number of participants that lived within rural areas in the current study. Rural areas tend to be classified as more socio-economically disadvantaged, but children who live in more rural areas tend to spend more time in nature than their urban counterparts (Collado et al., 2015). Conversely, Anderson and Krettenauer (2021) found that people living in rural areas tended to demonstrate less pro-environmental behaviours than people from urban areas. Whilst they may have some influence, socio-economic conditions may be less important than first thought, and highly dependent on other contextual factors. As such, we should consider when and how young people utilise nature spaces around them and if the context of certain rural areas has an effect. For example, people living in rural areas where logging or livestock are the main income sources may have a connection to nature due to frequent contact, yet their view of pro-environmental behaviours may differ because their livelihoods rely on utilising the natural environment as a commodity.

Consistent with past literature, there was a negative association between age and both time in nature and connection to nature in the full sample, and with time in nature also in the sub-sample. As children get older, they spend less time in nature and they feel less connected to nature. Though, whether the decrease in nature connectedness is due to the children spending less time interacting with nature or due to other external factors is unclear. Studies have consistently observed that connection to nature and environmental attitudes tend to decline as children reach adolescence—with decline typically beginning between the ages of 10-15 years (Keith et al., 2021; Otto et al., 2019; Richardson et al., 2019). Whilst the current study did not look at the attitudes and behaviours of children over the age of 12, we can already see the beginning of this trend within our sample. There is a number of possible reasons why this decline occurs. One reason is that adolescence is a time of life changes and identity formation where young people begin to develop a clear and unique view of self and their place in the world (Santrock, 2017). During this time, adolescence may lose interest in nature as their priorities change (Eames et al., 2018). However, they may return to their pre-adolescent levels of connectedness to nature once they have an established sense of their unique identity (Richardson et al., 2019), again pointing to the importance of early nature engagement and development of connection to the natural environment. Adolescence is also a time of egocentrism where young people become more self-conscious with an increased sense of invulnerability and of being “on stage”—that their actions are constantly noticed by others (Elkline, 1976). It is perhaps this false sense of invulnerability that may lead adolescents to view the environmental crisis as less personally meaningful because they feel it is unlikely to affect them. Eames et al. (2018) suggest that the dip may be due to this discord adolescents experience between their egocentrism and a more eco-centric perspective. Instead, environmental issues serve more as a means to establish

autonomy through political activism and group alignment, and exercise developing moral reasoning capabilities (Gibbs, 2019; Krettenauer, 2017).

Another potential reason is that as children reach adolescence, they become more independent and therefore have less contact with parents who may have previously influenced and encouraged their connection to nature in a context of ongoing identity formation (Leifländer et al., 2013). This potentially highlights the added importance of considering other influential role models throughout and beyond the child period. Clearly further exploration of the factors influencing the dip in child and adolescent nature connectedness and time spent in nature presents is warranted. If future research can clarify the reasons as to why this pattern occurs, this knowledge will allow targeted development of interventions aimed at either preventing the decline from occurring or to reacquaint adolescents with developmentally relevant nature connecting engagements.

Implications

In terms of theoretical implications, the current study sheds light on the underlying mechanisms that influence children's likelihood of engaging in behaviours that benefit the environment. The results add to a growing evidence base emphasising the importance of children spending time in nature as a determinant of pro-environmental behaviours (Hahn, 2021; Whitburn et al., 2019). Given that these behaviours can endure into adulthood (Asah et al., 2018; Rosa et al., 2018) and adult attitudes to nature may prove to be less susceptible to change (Kaiser et al., 2014), it is essential to nurture this relationship during childhood. Despite being victims of previous generations' environmental failures, children will be responsible for future environmental policies and climate action. Therefore, understanding how we can create future agents of change is an important area of research if they are to correct the missteps of the past.

Despite the relationship between time in nature, connection to nature and pro-environmental behaviours, the direction of these relationships cannot be fully determined by the current cross-sectional research approach. Research better clarifying the complexities of the interactions between these variables, by implementing longitudinal and experimental study designs, will assist in building on the results presented here and in determining effective targets for interventions and education.

Despite this limitation, the current study presents implications that are practical and applicable within both an educational setting and the home. Past findings have shown that children not only enjoy hands-on nature experiences but that these experiences can increase their connection to nature and create a sense of environmental stewardship, especially if experiences are authentic (Barthel et al., 2018; Kharod & Arreguín-Anderson, 2018). By authentic, Barthel et al. suggests that nature experiences should be real or closely resemble real-life nature experiences. Authentic hands-on experiences where children are free to explore and direct their own interactions with nature tend to offer more chances for meaningful sensory learning experiences compared to what we might otherwise see within the classroom (Beery & Jørgensen, 2018). Therefore, we see an opportunity for the inclusions of authentic, hands-on experiences within environmental education programs as a way of developing children's environmental stewardship. By encouraging children to spend time in nature and giving them the freedom to let their own curiosity guide their exploration they can create meaningful nature memories. This is not to say that this should replace environmental education within the classroom; simply that both knowledge and experience are important factors in developing pro-environmental attitudes and behaviours.

Limitations and Future Research

As mentioned, due to the correlational design of this study, we are unable to infer causation or determine the directionality of the variables. It is possible that rather than time in nature increasing connection to nature, children who have a strong connection to nature are simply more likely to seek or find ways to spend time there. Nonetheless, we have added to the growing list of literature recognising the importance of spending time in nature as a way of increasing care for the environment. A recent meta-analysis found that only a few experimental studies have been able to infer a causal relationship between spending time in nature and pro-environmental behaviours—though many of these used only short periods of nature exposure (Mackay & Schmitt, 2019). There is evidence that the longer the duration time spent in nature, the more likely it is to increase conservation behaviours, though these studies were also limited in their ability to infer causality (Collado et al., 2013, Martin et al., 2020). This highlights the need for further research using experimental designs to determine whether longer periods of exposure to nature changes the level of engagement in pro-environmental behaviours.

The self-report survey is likely to have left the current study vulnerable to responses influenced by social desirability bias. Nevertheless, there remains evidence that behaviours are a direct reflection of attitudes—it is likely the cost of the associated behaviour that may act as a barrier to actually engaging in it (Kaiser et al., 2010). As such, we remain confident in our methodological approach and see the opportunity to explore attitudes and behaviours further. We know that there is a gap between pro-environmental intentions and actions—even people with a very strong connection to nature may not engage in pro-environmental behaviours despite stating their intentions to do so (Fien et al., 2002; Richardson et al., 2019). It is therefore important to consider other factors that may affect an individual's likelihood to engage in pro-environmental

behaviours. Stern (2000) believes that it is a belief about an individual's own ability to take action, or agency, which is key to mediating the relationship between environmental attitudes and behaviours. Therefore, future research should consider the role of children's sense of agency and whether this bridges the gap between pro-environmental intentions and actions.

We would like to acknowledge two more limitations of the study. Firstly, the measure of amount of time spent in nature simply asked if the children spent time outdoors when at home and at school. It was not a measure of the *type* of activity—whether it was nature related or otherwise. The type of nature activity is likely to be an important factor to explore given it can affect the level of connection to nature as well as the likelihood of engaging in pro-environmental behaviours (Cooper et al., 2015). Secondly, the schools registered their interest to be in the study and those that chose to participate may have done so due to a pre-existing interest in the environment. Given that the results showed relatively high average levels of nature connectedness and pro-environmental behaviours the results may not be generalisable to children in contexts that place very minimal attention on the environment and nature more broadly. A number of studies have looked at the frequency of engagement in and type of nature activity during their childhood (Pensini et al., 2016; Rosa et al., 2018; 2019). Whilst these studies arrived at similar results, they used adult retrospective accounts. These accounts rely on memory which leaves them vulnerable to misinformation and exaggerations. To avoid these limitations, future research in this area should utilise a longitudinal study design where the type of activity is accounted for, and the duration and frequency of activity is measured. From this, we may be able to determine what kind of activity leads to the greatest connection to nature or more pro-environmental behaviours, and how frequently children should be participating in nature activities to do so.

Our final consideration is not so much a specific limitation of the current study, rather a limitation and an inherent problem within this field of research. With regards to the concept of nature connectedness, there is a lack of a clear and consistent definition across the literature (Giusti et al., 2018; Ives et al., 2017). Ives et al. found varied definitions of nature connectedness whilst many studies failed to define what nature even is. However, something studies all had in common was the focus on Western cultures. This highlights the need for operationalisation and standardisation of the concept of nature connectedness that will improve the quality and generalisability of the results, at least within a Western context.

Regardless of the limitations, the current study supports findings from a growing body of research that have determined the importance of childhood nature experiences in encouraging pro-environmental behaviours (Barrera-Hernández et al., 2020; Chawla, 2007; Molinario et al., 2020). Therefore, the current study has helped to further advance the research in the expanding field of environmental psychology.

Conclusion

This study set out to explore how nature connectedness influences children's pro-environmental behaviours as a result of spending time in nature. Overall, the results suggest formation of connectedness to nature is a critical mechanism by which time in nature translates into environmental action. We see a number of parallels between our results and past research in this field with evidence supporting the framework developed by Giusti et al. (2018) where children must be *in* and *with* nature before they act *for* nature. Similarly, the results support Schultz's (2002) three components that encourage environmentally positive behaviours of caring, connectedness and commitment. We predicted that teachers would play an important part in strengthening that relationship. Whilst the results did not fully confirm this, there was some

support that role models who have a strong connection to nature play an important part in consolidating children's connectedness to nature. Something as simple as spending time in nature as a child, during class or while at home, may help to create adults who have a deep care for and a desire to protect nature. The evidence provided here can aid in the development of environmental education programs that maximise their effectiveness in creating future agents of positive environmental change. We have also emphasised the importance of nature engagement during younger childhood, and this also highlights the need for future research into the period of later child and adolescent decline in nature connectedness.

References

- Alcock, I., White, M. P., Pahl, S., Duarte-Davidson, R., & Fleming, L. E. (2020). Associations between pro-environmental behaviour and neighbourhood nature, nature visit frequency and nature appreciation: Evidence from a nationally representative survey in England. *Environment International*, *136*, 105441.
- Anderson, D. J., & Krettenauer, T. (2021). Connectedness to nature and pro-environmental behaviour from early adolescence to adulthood: A comparison of urban and rural Canada. *Sustainability (Basel, Switzerland)*, *13*(7), 3655.
- Arendt, F., & Matthes, J. (2016). Nature documentaries, connectedness to nature, and pro-environmental behavior. *Environmental Communication*, *10*(4), 453-472.
- Asah, S. T., Bengston, D. N., Westphal, L. M., & Gowan, C. H. (2018). Mechanisms of children's exposure to nature: predicting adulthood environmental citizenship and commitment to nature-based activities. *Environment and Behavior*, *50*(7), 807-836.
- Australian Bureau of Statistics. (2016). *Census of population and housing: Socio-economic indexes for areas (SEIFA) 2016* (Report no. 2033.0.55.001). <https://www.abs.gov.au>
- Australian Curriculum, Assessment and Reporting Authority. (2021). *Cross-curriculum priorities: Sustainability*. <https://www.australiancurriculum.edu.au/f-10-curriculum/cross-curriculum-priorities/sustainability/>
- Bandura, A. (1977). Self-efficacy: Toward a unifying theory of behavioral change. *Psychological Review*, *84*(2), 191-215.
- Barrera-Hernández, L. F., Sotelo-Castillo, M. A., Echeverría-Castro, S. B., & Tapia-Fonllem, C. O. (2020). Connectedness to nature: its impact on sustainable behaviors and happiness in children. *Frontiers in Psychology*, *11*(276).

- Barthel, S., Belton, S., Raymond, C. M., & Giusti, M. (2018). Fostering children's connection to nature through authentic situations: the case of saving salamanders at school. *Frontiers in Psychology, 9*(JUN), 928-928.
- Barton, J., Bragg, R., Pretty, J., Roberts, J., & Wood, C. (2016). The wilderness expedition: an effective life course intervention to improve young people's well-being and connectedness to nature. *The Journal of Experiential Education, 39*(1), 59-72.
- Beery, T. (2020). Exploring access to nature play in urban parks: resilience, sustainability, and early childhood. *Sustainability, 12*(12), 4894.
- Beery, T., & Jørgensen, K. A. (2018). Children in nature: sensory engagement and the experience of biodiversity. *Environmental Education Research 24*(1), 13-25.
- Bilton, H. (2020). Values stop play? Teachers' attitudes to the early years outdoor environment. *Early Child Development and Care, 190*(1), 12-20.
- Blazar, D., & Kraft, M. A. (2017). Teacher and teaching effects on students' attitudes and behaviors. *Educational Evaluation and Policy Analysis, 39*(1), 146-170.
- Brehm, J. M., Eisenhauer, B. W., & Stedman, R. C. (2013). Environmental concern: examining the role of place meaning and place attachment. *Society & Natural Resources, 26*(5), 522-538.
- Bruni, C. M., Winter, P. L., Schultz, P. W., Omoto, A. M., & Tabanico, J. J. (2017). Getting to know nature: evaluating the effects of the Get to Know Program on children's connectedness with nature. *Environmental Education Research, 23*(1), 43-62.
- Bruni, C. M., Ballew, M. T., Winter, P. L., & Omoto, A. M. (2018). Natural history museums may enhance youth's implicit connectedness with nature. *Ecopsychology, 10*(4), 28-288.

- Capaldi, C. A., Dopko, R. L., & Zelenski, J. M. (2014). The relationship between nature connectedness and happiness: a meta-analysis. *Frontiers in Psychology, 5*, 976-976.
- Chawla, L. (1999). Life Paths Into Effective Environmental Action. *The Journal of environmental education, 31*(1), 15-26.
- Chawla, L. (2007). Childhood experiences associated with care for the natural world: A theoretical framework for empirical results. *Children, Youth and Environments, 17*(17), 144-170.
- Chawla, L., & Derr, V. (2012). The Development of Conservation Behaviors in Childhood and Youth. In (Vol. 1): Oxford University Press.
- Chawla, L., & Gould, R. (2020). Childhood nature connection and constructive hope: A review of research on connecting with nature and coping with environmental loss. *People and Nature (Hoboken, N.J.), 2*(3), 619–642.
- Cheng, J. C.-H., & Monroe, M. C. (2012). Connection to nature: children's affective attitude toward nature. *Environment and Behavior, 44*(1), 31-49.
- Clements, R. (2004). An Investigation of the Status of Outdoor Play. *Contemporary Issues in Early Childhood, 5*(1), 68-80.
- Collado, S., & Corraliza, J. A. (2013). Children's restorative experiences and self-reported environmental behaviors. *Environment and Behavior, 47*(1), 38-56.
- Collado, S., Corraliza, J. A., Staats, H., & Ruiz, M. (2015). Effect of frequency and mode of contact with nature on children's self-reported ecological behaviors. *Journal of Environmental Psychology, 41*, 65-73.

- Cooper, C., Larson, L., Dayer, A., Stedman, R., & Decker, D. (2015). Are wildlife recreationists conservationists? Linking hunting, birdwatching, and pro-environmental behavior. *The Journal of Wildlife Management*, 79(3), 446-457.
- Eames, C., Barker, M., & Scarff, C. (2018). Priorities, identity and the environment: Negotiating the early teenage years. *The Journal of Environmental Education*, 49(3), 189-206.
- Elkind, D. (1976). *Child development and education: A Piagetian perspective*. Oxford U Press.
- Erdfelder, E., Faul, F., & Buchner, A. (1996). GPOWER: A general power analysis program. *Behavior Research Methods, Instruments & Computers*, 28(1), 1–11.
- Ernst, J., & Theimer, S. (2011). Evaluating the effects of environmental education programming on connectedness to nature. *Environmental Education Research*, 17(5), 577-598.
- Ewert, A., Place, G., & Sibthorp, J. I. M. (2005). Early-life outdoor experiences and an individual's environmental attitudes. *Leisure Sciences*, 27(3), 225-239.
- Fielding, K. S., & Head, B. W. (2012). Determinants of young Australians' environmental actions: the role of responsibility attributions, locus of control, knowledge and attitudes. *Environmental Education Research*, 18(2), 171-186.
- Fien, J., Teh-Cheong Poh Ai, I., Yencken, D., Sykes, H., & Treagust, D. (2002). Youth environmental attitudes in Australia and Brunei: implications for education. *The Environmentalist*, 22(3), 205-216.
- Folke, C., Jansson, Å., Rockström, J., Olsson, P., Carpenter, S. R., Stuart Chapin III, F., Crépin, A-S., Daily, G., Danell, K., Ebbesson, J., Elmqvist, T., Galaz, V., Moberg, F., Nilsson, M., Österblom, H., Ostrom, E., Persson, Å., Peterson, G., Polasky, S., ... Westley, F. (2011). Reconnecting to the biosphere. *AMBIO*, 40, 719-738.

- Frantz, C., Mayer, F. S., Norton, C., & Rock, M. (2005). There is no “I” in nature: The influence of self-awareness on connectedness to nature. *Journal of Environmental Psychology*, 25(4), 427-436.
- Gibbs, J. C. (2019). Stages of adolescent moral development. In S. Hupp, & J. D. Jewell (Eds.), *The encyclopedia of child and adolescent development*. John Wiley & Sons, Inc.
- Giusti, M., Barthel, S., & Marcus, L. (2014). Nature routines and affinity with the biosphere: a case study of preschool children in Stockholm. *Children, Youth and Environments*, 24(3), 16-24.
- Giusti, M., Svane, U., Raymond, C. M., & Beery, T. H. (2018). A framework to assess where and how children connect to nature. *Frontiers in Psychology*, 8, 2283-2283.
- Giusti, M. (2019). Human-nature relationships in context. Experiential, psychological, and contextual dimensions that shape children’s desire to protect nature. *PLoS ONE*, 14(12): e0225951.
- Hahn, E. R. (2021). The developmental roots of environmental stewardship: Childhood and the climate change crisis. *Current opinion in psychology*, 42, 19-24.
- Harvey, D. J., Montgomery, L. N., Harvey, H., Hall, F., Gange, A. C., & Watling, D. (2020). Psychological benefits of a biodiversity-focussed outdoor learning program for primary school children. *Journal of Environmental Psychology*, 67, 101381.
- Hayes, A. F. (2018). *Introduction to mediation, moderation, and conditional process analysis: a regression-based approach* (Second edition.). The Guilford Press.
- Hunt, A., Burt, J., & Stewart, D. (2015). *Monitor of engagement with the natural environment: A pilot or an indicator of visits to the natural environment by children—Interim findings from year 1*. Natural England.

- Huynh, T., & Torquati, J. C. (2019). Outdoor adventure instructors' perceptions of nature and their work: a phenomenological study. *Journal of Adventure Education and Outdoor Learning*, 19(3), 269-282.
- IPBES. (2019). *Global assessment report of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services*. Brondízio, E. S., Settele, J., Díaz, S., Ngo, H. T. (eds). IPBES secretariat, Bonn, Germany, ISBN: 978-3-947851-20-1.
- Ives, C. D., Giusti, M., Fischer, J., Abson, D. J., Klaniiecki, K., Dorninger, C., Laudan, J., Barthel, S., Abernathy, P., Martin-Lopez, B., Raymond, C. M., Kendal, D., & von Wehrden, H. (2017). Human–nature connection: a multidisciplinary review. *Current Opinion in Environmental Sustainability*, 26-27, 106-113.
- Ives, C. D., Abson, D. J., von Wehrden, H., Dorninger, C., Klaniiecki, K., & Fischer, J. (2018). Reconnecting with nature for sustainability. *Sustainability Science*, 13(5), 1389-1397.
- Kaiser, F. G., Byrka, K., & Hartig, T. (2010). Reviving campbell's paradigm for attitude research. *Personality and social psychology review*, 14(4), 351-367.
- Kaiser, F. G., Brügger, A., Hartig, T., Bogner, F. X., & Gutscher, H. (2014). Appreciation of nature and appreciation of environmental protection: How stable are these attitudes and which comes first? *European Review of Applied Psychology*, 64(6), 269-277.
- Karataş, A. (2016). The role of environmental education in transition from anthropocentrism to ecocentrism. *International Journal of Business and Social Science*, 7(1), 125-129.
- Keith, R. J., Given, L. M., Martin, J. M., & Hochuli, D. F. (2021). Urban children's connections to nature and environmental behaviors differ with age and gender. *PloS one*, 16(7), e0255421.
- Kellert, S. R., & Wilson, E. O. (1993). *The Biophilia hypothesis*. Island Press.

- Kharod, D., & Arreguín-Anderson, M. G. (2018). From aversion to affinity in a preschooler's relationships with nature. *Ecopsychology, 10*(4), 317-327.
- Kidner, D. W. (2001). *Nature and psyche: radical environmentalism and the politics of subjectivity*. Albany, N.Y. State University of New York Press.
- Klepeis, N. E., Nelson, W. C., Ott, W. R., Robinson, J. P., Tsang, A. M., Switzer, P., Behar, J. V., Hern, S. C., Engelmann, W. H. (2001). The National Human Activity Pattern Survey (NHAPS): a resource for assessing exposure to environmental pollutants. *Journal of Exposure Science & Environmental Epidemiology, 11*(3), 231-252.
- Kollmuss, A., & Agyeman, J. (2002). Mind the gap: Why do people act environmentally and what are the barriers to pro-environmental behavior? *Environmental Education Research, 8*(3), 239-260.
- Krettenauer, T. (2017). Pro-environmental behavior and adolescent moral development. *Journal of Research on Adolescence, 27*(3), 581-593.
- Liefländer, A. K., Fröhlich, G., Bogner, F. X., & Schultz, P. W. (2013). Promoting connectedness with nature through environmental education. *Environmental Education Research, 19*(3), 370-384.
- Lovelock, B., Walters, T., Jellum, C., & Thompson-Carr, A. (2016). The participation of children, adolescents, and young adults in nature-based recreation. *Leisure Sciences, 38*(5), 441-460.
- Louv, R. (2005). *Last child in the woods: saving our children from nature-deficit disorder*. Algonquin Books.
- Mackay, C. M. L., & Schmitt, M. T. (2019). Do people who feel connected to nature do more to protect it? A meta-analysis. *Journal of Environmental Psychology, 65*, 101323.

- Martin, L., White, M. P., Hunt, A., Richardson, M., Pahl, S., & Burt, J. (2020). Nature contact, nature connectedness and associations with health, wellbeing and pro-environmental behaviours. *Journal of Environmental Psychology, 68*, 101389.
- Mayer, F. S., & Frantz, C. M. (2004). The connectedness to nature scale: a measure of individuals' feeling in the community with nature. *Journal of Environmental Psychology, 24*, 503-515.
- Mayer, F. S., Frantz, C. M., Bruehlman-Senecal, E., & Dolliver, K. (2009). Why is nature beneficial?: The role of connectedness to nature. *Environment and Behavior, 41*(5), 607-643.
- McFarland, A. L., Zajicek, J. M., & Waliczek, T. M. (2014). The relationship between parental attitudes toward nature and the amount of time children spend in outdoor recreation. *Journal of Leisure Research, 46*(5), 525-539.
- Molinario, E., Lorenzi, C., Bartoccioni, F., Perucchini, P., Bobeth, S., Colléony, A., Diniz, R., Eklund, A., Jaeger, C., Kibbe, A., Richter, I., Ruerpert, A., Sloom, D., Udall, M., & Bonaiuto, M. (2020). From childhood nature experiences to adult pro-environmental behaviors: An explanatory model of sustainable food consumption. *Environmental Education Research, 26*(8), 1137-1163.
- OECD (2019), "How much time do students spend in the classroom?", in *Education at a Glance 2019: OECD Indicators*, OECD Publishing, Paris.
- Otto, S., & Pensini, P. (2017). Nature-based environmental education of children: environmental knowledge and connectedness to nature, together, are related to ecological behaviour. *Global Environmental Change, 47*, 88-94.

- Otto, S., Evans, G. W., Moon, M. J., & Kaiser, F. G. (2019). The development of children's environmental attitude and behavior. *Global Environmental Change, 58*, 101947.
- Pensini, P., Horn, E., & Caltabiano, N. J. (2016). An exploration of the relationship between adults' childhood and current nature exposure and their mental well-being. *Children, Youth and Environments, 26*(1), 125-147.
- Pham, T.-T.-H., Apparicio, P., Séguin, A.-M., Landry, S., & Gagnon, M. (2012). Spatial distribution of vegetation in Montreal: An uneven distribution or environmental inequity? *Landscape and Urban Planning, 107*(3), 214-224.
- Pianta, R. C., & Hamre, B. K. (2009). Conceptualization, measurement, and improvement of classroom processes: standardized observation can leverage capacity. *Educational Researcher, 38*(2), 109-119.
- Pyle, R. M. (2003). Nature matrix: reconnecting people and nature. *Oryx, 37*(2), 206-214.
- Richardson, M., Hunt, A., Hinds, J., Bragg, R., Fido, D., Petronzi, D., Barbett, L., Clitherow, T., & White, M. (2019). A measure of nature connectedness for children and adults: validation, performance, and insights. *Sustainability, 11*(12), 3250.
- Rosa, C. D., Profice, C. C., & Collado, S. (2018). Nature experiences and adults' self-reported pro-environmental behaviours: the role of connectedness to nature and childhood nature experiences. *Frontiers in Psychology, 9*, 1055.
- Rosa, C. D., Collado, S., Profice, C. C., & Larson, L. R. (2019). Nature-based recreation associated with connectedness to nature and leisure satisfaction among students in Brazil. *Leisure Studies, 38*(5), 682-691.
- Santrock, J. W. (2017). Physical and cognitive development in adolescence. *Life-span development* (16th ed.). McGraw-Hill.

- Schultz, P. W. (2002). Inclusion with nature: the psychology of human-nature relations. In P. Schmuck & W. P. Schultz (Eds.), *Psychology of Sustainable Development* (pp. 61-78). Boston, MA: Springer US.
- Shwartz, A., Cosquer, A., Jaillon, A., Piron, A., Julliard, R., Raymond, R., Simon, L., & Prévot-Julliard, A.-C. (2012). Urban biodiversity, city-dwellers and conservation: how does an outdoor activity day affect the human-nature relationship? *PloS one*, 7(6), e38642.
- Snyder, C. R., Hoza, B., Pelham, W. E., Rapoff, M., Ware, L., Danovsky, M., Highberger, L., Rubinstein, H., & Stahl, K. J. (1997). The development and validation of the children's hope scale. *Journal of Pediatric Psychology*, 22(3), 399-421.
- Snyder, C. R., & Lopez, S. J. (2005). *Handbook of Positive Psychology*. New York: Oxford University Press.
- Soga, S., & Gaston, K. J. (2016). Extinction of experience: the loss of human-nature interactions. *Frontiers in Ecology and the Environment*, 14(2), 94-101.
- Steffen, W., Persson, Å., Deutsch, L., Zalasiewicz, J., Williams, M., Richardson, K., Crumley, C., Crutzen, P., Folke, C., Gordon, L., Molina, M., Ramanathan, V., Rockström, J., Scheffer, M., Schellnhuber, H. N., & Svedin, U. (2011). The Anthropocene: From Global Change to Planetary Stewardship. *Ambio*, 40(7), 739-761.
- Stern, P. C. (2000). Toward a coherent theory of environmentally significant behavior. *Journal of Social Issues*, 56(3), 407.
- Stern, M. J., Powell, R. B., & Ardoin, N. M. (2008). What difference does it make? assessing outcomes from participation in a residential environmental education program. *The Journal of Environmental Education*, 39(4), 31-43.

- Stern, M. J., Frensley, B. T., Powell, R. B., & Ardoin, N. M. (2018). What difference do role models make? Investigating outcomes at a residential environmental education center. *Environmental Education Research, 24*(6), 818-830.
- Stets, J. E., & Biga, C. F. (2003). Bringing identity theory into environmental sociology. *Sociological Theory, 21*(4), 398-423.
- Tam, K.-P. (2013). Concepts and measures related to connection to nature: similarities and differences. *Journal of Environmental Psychology, 34*, 64-78.
- United Nations Population Division. (2020). *Policies on spatial distribution and urbanization have broad impacts on sustainable development*. Department of Economic and Social Affairs, United Nations. <https://www.un.org>
- Vandermaas-Peeler, M., Dean, C., Biehl, M. S., & Mellman, A. (2019). Parents' beliefs about young children's play and nature experiences in Danish and US contexts. *Journal of Adventure Education and Outdoor Learning, 19*(1), 43-55.
- Vaske, J. J., & Kobrin, K. C. (2001). Place attachment and environmentally responsible behavior. *The Journal of Environmental Education, 32*(4), 16-21.
- Vining, J., & Merrick, M. S. (2012). Environmental epiphanies: theoretical foundations and practical applications. In (Vol. 1): Oxford University Press.
- Wells, N.M., & Lekies, K. S. (2006). Nature and the life course: Pathways from childhood nature experiences to adult environmentalism. *Children, Youth and Environments, 16*(1), 1-24
- Whitburn, J., Linklater, W. L., & Milfont, T. L. (2019). Exposure to urban nature and tree planting are related to pro-environmental behavior via connection to nature, the use of nature for psychological restoration, and environmental attitudes. *Environment and Behavior, 51*(7), 787-810.

Whitten, T., Stevens, R., Ructtinger, L., Tzoumakis, S., Green, M. J., Laurens, K. R., Holbrook, A., Carr, V. J. (2018). Connection to the natural environment and well-being in middle childhood. *Ecopsychology*, 10(4), 27-279.

Appendix 1: Student Survey Questions

Upper Primary Survey Questions

<p>How old are you? What is your year level? Gender Would you describe yourself as? (Australian, Aboriginal or Torres Strait islander etc.) State you live in Suburb where you live</p>	
I	play outdoors when at home
I	play outdoors when I'm here
I	like it when we do classwork outside
I	feel happy when I'm outside
I	like touching animals and plants
I	like playing outside
I	feel that being in nature is important to me
I	feel that I am part of nature
I	don't think that we can live without plants and animals
I	like listening to birds
I	like looking at plants and flowers
I	like working and playing in the garden
I	like collecting rocks or shells
I	like being outside because it makes me feel calm
I	think nature is beautiful
I	feel that nature is amazing
I	feel sad when animals are hurt
I	feel that looking after plants and animals is important
I	feel happy when animals have a clean home
I	do things to help nature
I	pick up rubbish
I	try not to hurt plants and animals

I	turn off the lights at home
I	help with the recycling at home
I	try not to waste water

Lower Primary Survey Questions

How old are you?	
Are you a girl or boy?	
I	play outdoors when at home
I	play outdoors when I'm here
I	like it when we do classwork outside
I	feel happy when I'm outside
I	like touching animals and plants
I	like playing outside
I	like listening to birds
I	like looking at plants and flowers
I	like working and playing in the garden
I	like collecting rocks or shells
I	like being outside because it makes me feel calm
I	feel sad when animals are hurt
I	think that looking after plants and animals is important
I	feel happy when animals have a clean home
I	pick up rubbish
I	try not to hurt plants and animals
I	turn off the lights at home when they are not needed
I	help with the recycling at home
I	try not to waste water

Appendix 2: Connection to Nature Index

Original items from the Connection to Nature Index (Cheng & Monroe, 2012).

I like to hear different sounds in nature
I like to see wild flowers in nature
When I feel sad, I like to go outside
Being in the natural environment makes me feel peaceful
I like to garden
Collecting rocks and shells is fun
Being outdoors makes me happy
I feel sad when wild animals are hurt
I like to see wild animals living in a clean environment
I enjoy touching animals and plants
Taking care of animals is important to me
Humans are part of the natural world
People cannot live without plants and animals
My actions will make the natural world different
Picking up trash on the ground can help the environment
People do not have the right to change the natural environment