BIOPHILIC VALUES AS PATHWAYS TO NATURE CONNECTEDNESS IN UPPER SECONDARY STUDENTS
AN ACTION RESEARCH STUDY

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Abstract

Aim: The purpose of the study was to investigate the effectiveness of activating the five biophilic values of emotion, contact, meaning, beauty, and compassion to increase upper secondary students’ nature connectedness and thereby their pro-environmental attitudes and behaviours.

Theory: The study was mainly based on the theory of the five biophilic values as pathways to nature connectedness; while also drawing on experiential learning theory, and the EYE for Sustainability Learning Tool.

Method: The research was conducted as an action research study of quasi-experimental pretest-posttest static nonequivalent comparison groups design. Mixed-methods consisting of a questionnaire with the established scales for measuring nature connectedness, the Connectedness to Nature Scale (CNS), the Nature Relatedness scale (NR-21) and the Inclusion of Nature in Self scale (INS); and qualitative and arts-based methods for a select number of students; comprising reflective texts, interviews, and drawings; were utilised to measure participants nature connectedness in the pre- and posttest. PEAB was measured by a PEAB scale and in interviews and reflective texts.

Participants in the intervention group were out of convenience students from the researchers own social science classes (aged 16-17) and the control group consisted of students in the grade above (aged 17-18), all other characteristics being similar.

Results: Firstly, results showed that the IG increased their nature connectedness more than the CG as measured by the NR-21, CNS and INS; this was also found in some of the interviews and reflective texts while the drawings were more difficult to interpret. Secondly, the IG increased their PEAB more than the CG as measured by the PEAB scale and through interviews and reflective texts. Findings indicated that the five biophilic values are effective in increasing nature connectedness and PEAB in upper secondary students.
Acknowledgements

My sincere thanks and gratitude to the students that participated in this study, evidently indispensable for this project and a constant source of inspiration; as well as to the headmaster of the upper secondary school where I work, for granting me permission to do the study and for endorsing the development of teaching for sustainability in our school; and of course, to my teacher colleagues and co-students for valuable advice and encouragement. I would especially like to thank my main supervisor Ebba Lisberg Jensen for guiding me through this process of completing my master’s thesis by giving thorough constructive feedback, support, and encouragement. And my co-supervisor Minna Panas, for advice and support on scales and statistics. I also want to thank all the teachers of the ESD master’s programme for their endless advice and encouragement. I would especially like to thank Sally Windsor for her guidance during the introductory course and for the opportunity to; parallel with the master’s studies; co-write a chapter: Teaching Social Sustainability and About Sweden’s Sami Peoples in Senior Secondary School in the book Education, Equity and Inclusion: Teaching and Learning for a Sustainable North; it was a very uplifting and developing experience, a childhood dream coming true. Finally, I acknowledge that the thesis is quite extensive for a master’s level; partly, this is due to the multiple methods being used to get as comprehensive a view as possible of the subject matter; however, the major reason for this is my dedication for education for sustainable development and achieving a sustainable future, I fully adhere to Richard Kahn’s urge to all teachers:

We must not be silenced by the intensity of the threat. Rather, we must teach as if our lives depend on it, because in a very real way, they do. (Kahn, 2019:148).
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List of Abbreviations

BVPNC  Biophilic Values as Pathways to Nature Connectedness
CG    Control Group
CNS   Connectedness to Nature Scale
ELT   Experiential Learning Theory
ESD   Education for Sustainable Development
EYE   Educating Yourself in Empowerment
IG    Intervention Group
INS   Inclusion of Nature in Self scale
NR-21 Nature Relatedness scale
PEAB  Pro-Environmental Attitudes and Behaviours
PEA   Pro-Environmental Attitudes
PEB   Pro-Environmental Behaviours
SD    Sustainable Development

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1. Introduction

There is increasing evidence that the state of our planet has reached a critical point, most notably climate change, deforestation; biodiversity loss, soil degradation; ocean acidification and eutrophication; pollution of air, water, and land; and declining freshwater supplies (IPBES, 2019; IPCC, 2021, 2022). The need for action is pressing, not just for the sake of humans but equally so for all beings; human, non-human, and the-more-than-human world. But what makes people care about and act for the natural world? As a teacher in upper secondary school dedicated to Education for Sustainable Development (ESD), this is a central issue for me; how can I develop learning environments and activities that offer opportunities for increased pro-environmental attitudes and behaviour (PEAB) in students? Which is why I decided to do action research within this area. I realised that a considerable amount of research has shown that connectedness to nature is a strong predictor of PEAB (DeVille et al., 2021); many scientists argue that the disconnection between humans, including human society, and nature, is one of the biggest sustainability challenges (Keaulana et al., 2021; Muhr, 2020; Zylstra et al., 2014; Miller, 2005). Moreover, unfamiliarity with nature may lead to devaluing and degrading it (Soga & Gaston, 2016). Correspondingly, Mayer and Frantz (2004) concluded that “if people feel connected to nature, then they will be less likely to harm it, for harming it would in essence be harming their very self” (p. 512).

Concurrently, there is a growing concern internationally, that children’s connection to nature is decreasing (Charles, 2009; Soga & Gaston, 2016; Imai et al, 2018; Cudworth & Lumber, 2021); terms such as nature-deficit disorder (Louv, 2005), and nature alienation (Cummings & Nash, 2015) have been used to describe this. Similarly, the term plant awareness disparity; also called plant blindness; have been coined to describe the low recognition and appreciation that people in Euro-centric cultures have for plants (Parsley, 2020). A majority of people in developed nations spend almost all of their time indoors (Evans and McCoy, 1998; MacKerron & Mourato, 2013). For instance, in the UK, 75% of all children perceive themselves as disconnected or separate from nature (RSPB, 2013); partly due to increased urbanization which leads to less meaningful experiences with nature (Pyle, 2003), and increased organisation of free time, resulting in less spontaneous outdoor experiences (Miller, 2005). Similarly, in a Swedish study, it was found that many of the participating upper secondary students tended to have a dualistic way of talking about the relationship between humans and nature; humans were not seen as a part of nature (Kramming, 2017). It has been suggested that the lack of nature connectedness is not only eroding the spatial connection that children have with the environment, but also makes them less complete as human beings (Veloso & Loureiro, 2017). Wals (2012) argues that: “Given the continued disconnect between people and their physical environment in general and with nature in particular, the continued decline of the state of the planet, and the increase in unsustainable lifestyles, the need for EE and [...] ESD remains unquestioned” (p. 640).

Consequently, it is relevant to study how education and ESD can provide opportunities for increased nature connectedness and thereby increased PEAB in upper secondary students. Before engaging further with this, a discussion of the concepts ESD, and Sustainable Development (SD), and how they are defined in this thesis is warranted.

ESD; although a disputed concept (see for example Jickling, 1992), and suffering from lack of consensus on what constitutes it, in part due to its complexity and its constantly evolving and contested nature (Reunamo & Pipere, 2011); strives to create opportunities for learning experiences that contribute to SD; and although there has been a debate on whether ESD should be instrumental or
emancipatory (Wals, 2012), Reunamo and Pipere (2011) conclude that “it’s been increasingly recognized that rather than focusing on the transfer of knowledge, ESD needs to enhance the capacity of individuals and organizations to confront change and transformation” (2011:111). According to UNESCO (n.d):

(ESD) empowers learners with knowledge, skills, values and attitudes to take informed decisions and make responsible actions for environmental integrity, economic viability and a just society […] enhances the cognitive, social and emotional and behavioral dimensions of learning [and] is recognized as a key enabler of all Sustainable Development Goals [SDGs] and achieves its purpose by transforming society”.

(UNESCO, n.d)

As for SD, what it comprises is further still debated. Although the most well-known definition of SD, from the Our common future report (popularly known as the Brundtland Report) defines SD as "Development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (World Commission on Environment and Development, 1987:16); this definition is loose and open for interpretation. Hence, what SD encompasses is debated; does it for example include the interests of all living beings and their coming generations, such as posthumanist researchers suggest (see for example Affifi, 2020; Braidotti, 2017; Kopnina & Cherniak, 2015, 2016), or does it only concern humans, such as the UN SDGs imply by focusing solely on human needs (UN, n.d.); the latter would be considered anthropocentric and speciesist by Oakley (2019); Dinker and Pedersen (2016) and posthumanist researchers.

Hence, what SD should entail is disputed, however from a posthumanist perspective that I as a teacher and researcher assume, SD and ESD should consider the interests of humans and presumed interests of the more-than-human-world equally, what Kopnina and Cherniak (2016) call a perspective of inclusive pluralism. With this posthumanist perspective on SD and ESD in mind, and even congruent with UNESCO’s (n.d.) definition of ESD; as being about empowering learners not only with knowledge but also values and attitudes for sustainability (see citation above, p. 3); it is reasonable to suggest that it is important to study how education can offer opportunities for increased NC in upper secondary students’, our coming generations, since this in turn increases their PEAB. This is relevant since increased PEAB could contribute to SD; in other words, to improve the state of the planet; which would benefit all: human, non-human-animal, and more-than-human-world beings.

Consequently, with this idea partially developed, the remaining query was how to achieve this in practice, how upper secondary students’ NC could be increased. Further literature review work revealed that studies on adults had shown that the five biophilic values of emotion, contact, meaning, beauty, and compassion are key pathways to nature connectedness (Lumber, 2016; Lumber et al., 2017). Hence, I decided to conduct a small-scale action research study of quasi-experimental design, utilising mixed-methods to investigate if the five biophilic values were effective in increasing nature connectedness, and PEAB, in upper secondary students. The study, although not generalisable, provides an example and a starting point for further studies on how education can contribute to increased nature connectedness and thereby PEAB in upper secondary students.

1.1 Research Problem and Statement of Relevance

Since research has shown a strong positive correlation between nature connectedness and PEAB (DeVille et al., 2021); which is highly needed given the state of the planet, and from an equality between species justice perspective of inclusive pluralism and posthumanism; and that nature connectedness is decreasing (Imai et al., 2018; Soga & Gaston, 2016); it is highly relevant to investigate how education can offer opportunities for increased nature connectedness. Since a positive correlation exists between nature exposure; activating five of the biophilic values, activities connected
to this; and nature connectedness; and given that it has been concluded that contemporary education does not offer much opportunity for students to connect with nature (Cudworth & Lumber, 2021), it seemed interesting and highly relevant to investigate if activating the five biophilic values could increase NC in two of the classes of upper secondary students that I teach. Lumber (2016) also endorses using the biophilic pathways as a framework in combination with education, stating that “The benefit to the student and their development through a first-hand experience of nature would be good not only for the individual but to the wider ecosystem to which they belong” (p. 159).

Investigating if activating biophilic values could increase nature connectedness and thereby PEAB in upper secondary students is clearly of high relevance for research in ESD since PEAB will be central in achieving SD, in other word, in reaching the goals for ESD.

Additionally, few studies have been done on increasing nature connectedness in general and very few studies have been done on how education can offer opportunities for upper secondary school students to increase their nature connectedness (Lumber, 2016), which indicates there is a clear gap here that needs to be filled. Moreover, very few studies have used qualitative methods to measure nature connectedness (DeVille et al, 2021; Muhr, 2020), hence this needs to be further explored.

Hence, an action research study; consisting of an educational intervention designed to activate biophilic values to increase nature connectedness; was performed in a class of upper secondary students that I teach. The study was based on and tested the theory of the five biophilic values of emotion, meaning, contact, beauty and compassion as pathways to nature connectedness (Lumber, 2016; Lumber et al., 2017); as well as drawing on theories of experiential learning theory and the pedagogical ‘EYE for Sustainability’ learning tool, to design the ESD educational activities (aimed at developing students agency and empowerment in sustainability issues) that were enmeshed with the design for activating the biophilic values. The study was of quasi-experimental pretest-posttest nonequivalent comparison groups design; utilising mixed-methods to measure the effects of the intervention.

1.2 Purpose of the Study

The aim of this action research study was to investigate if learning environments and activities designed to activate biophilic values in the upper secondary students that I teach, were effective in increasing their nature connectedness and PEAB.

As for the scope of the study, after having identified a problem, action research can be described as a cycle or spiral of planning, acting, observing, and reflecting; that then leads to a revised plan, new action, and as such the cycles continue (Burns, 2010:9). Since this is a master's thesis and time was limited, only one cycle was completed in which the effectiveness of the five biophilic values on increasing upper secondary students’ nature connectedness as well as PEAB was tested; for this first cycle, the quasi-experimental design was a very useful evaluation tool (Fraenkel et al., 2019:542-543). Moreover, since time and resources were restricted, it was necessary to limit the number of participants as well as further limiting the samples of the qualitative and arts-based methods.

1.3 Research Questions and Hypotheses

The AR study was of quasi-experimental static-group pretest-posttest nonequivalent comparison groups design (Fraenkel et al., 2019:264) utilising mixed-methods (MMR) consisting of a questionnaire with psychometric scales, reflective texts, interviews, and drawings to measure nature connectedness and PEAB of the intervention group compared to a control group. T-tests were performed in Excel to test for statistically significant differences between group means of the
intervention group and the control group on the scales. The following research questions guided this study:

(1) How does an intervention aimed at activating biophilic values affect upper secondary students' nature connectedness?
   Null hypothesis ($H_0$): Students participating in the intervention aimed at activating biophilic values will not increase their nature connectedness more than the control group.
   Alternative hypothesis ($H_1$): Students participating in the intervention aimed at activating biophilic values will increase their nature connectedness more than the control group.

(2) How does an intervention aimed at activating biophilic values affect upper secondary students' pro-environmental attitudes and behaviour?
   Null hypothesis ($H_0$): Students participating in the intervention aimed at activating biophilic values will not increase their pro-environmental attitudes and behaviour more than the control group.
   Alternative hypothesis ($H_1$): Students participating in the intervention aimed at activating biophilic values will increase their pro-environmental attitudes and behaviour more than the control group.

1.4 Significance of the Study

The study serves as an example of how upper secondary education can offer students opportunities for increased nature connectedness by incorporating the activation of biophilic values into daily teaching activities and learning environments. This can serve as a starting point for further and more extensive studies in the area. Finding ways to increase students’, our coming generations’, nature connectedness and thereby their PEAB is essential in achieving a sustainable development which would benefit all of the earth’s inhabitants, both humans and the more-than-human-world. Achieving sustainability is without a doubt the most urgent and fateful issue of our time (UN, 2019).

1.5 Assumptions and Positionality

From the very start to the very end, from selecting the research topic to the final interpretation of results, the researcher’s assumptions will be at work to guide their thinking process (Malterud, 2001). Assumptions are necessary for rationalising the research topic and for interpreting results, however, they need to be clarified for transparency (Rudestam & Newton, 2014); according to Reunamo and Pipere (2011) “To study complex and controversial subjects such as sustainable development, the researchers need to be aware of their preferences and orientations” (p. 110). According to their categorization of researchers, I position myself within category four Participative - agentive, accommodative; since I view ESD as a cultural product and assume that studying it is partaking in developing environment and society, to make possible new discoveries, as well as the creation of understanding of, and tools for, ESD; since this is what I strive for. Moreover, I adhere to Kopnina and Cherniak’s (2016) perspective of Inclusive Pluralism, maintaining that in research as well as within education, the assumed interests of all beings; non-human animals, human animals, plants, natural objects, and natural habitats; should be taken into equal consideration. I also agree with posthumanist theories that suggest that humans and nature are not separate entities but part of the same whole, that humans and nonhuman beings are equal, and that all living and nonliving things are to be seen as equal factors in life; which should be reflected in the SD discourse which is currently often burdened with anthropocentric and speciesist assumptions (Affifi, 2020; Braidotti, 2017). Affifi (2020) argues that bringing students into nature puts them in contact with plants, animals,
and natural processes; which might stimulate viewing them as equals in life constructing processes; which might lead to learning to nurture, love, and co-evolve with them.

1.6 Operational Terms and Definitions

1.6.1 Nature Connectedness

To start with, in research on Nature Connectedness, nature is defined as “the physical world and everything in it (such as plants, animals, mountains, oceans, stars, etc.) that is not made by people” (Merriam-Webster, n.d.), and humans are seen as part of nature, not separated from it (Mayer et al., 2009; DeVille et al., 2021). Humanity is seen as of, rather than in, the natural world; as having a relationship with the rest of nature at the same time as being a part of nature, not separated from it, which the term could be misinterpreted as implying (see for example McPhie & Clarke, 2015). As Lumber (2016) puts it, it is about endorsing “an acceptance of a relationship and connection that already exists” (p. 42). Fletcher (2017), that has criticised the concept nature connectedness and the idea of connecting with nature; which he calls an oxymoron since it suggests a separation; has simply misunderstood that you can at the same time be a part of something that you have a relationship with that can be stronger or weaker; just as a tree can have a strong or weak connection with the other trees in the forest, or a leaf with the rest of the tree, or a person with the rest of her family (which she is also a part of). Moreover, Fletcher (2017) thinks that nature connectedness places too much emphasis on the individual and therefore reinforces a neoliberal framework; but encouraging people to connect with and care for nature says nothing about the ways they should go about solving sustainability problems; whether the focus should be on individual lifestyle choices or if these individuals should mainly operate by selecting politicians that will work for structural changes, and other democratic ways of influencing society, such as demonstrations. Additionally, Fletcher (2017) misses the point when he argues against the definition of nature as something separate from the built environment; a large body of research shows that spending time in nature (as in the non-built environment) has many physical and mental health benefits compared to spending time in built environments (see for example this review: DeVille, et al., 2021). For example, patients with windows facing a brick wall took more analgesics, had a longer post-operative stay, and more negative comments than patients with a view of natural settings (Ulrich, 1984); and people walking down a city street performed worse on a memory test than those walking in a natural setting, this since urban environments are filled with stimuli that require a lot of attention and therefore are less restorative than natural settings (Berman et al., 2008) (see also chapter 2.1 in this thesis on the benefits of nature connectedness).

Many variations in defining nature connectedness exist, as well as many related constructs describing the same or similar phenomena (such as Nature Relatedness, Inclusion of Nature in Self, Connectivity With Nature, and Emotional Affinity Towards Nature), however both the varying constructs related to nature connectedness, and the different measuring tools created to measure it, strongly correlate (Tam, 2013; DeVille et al., 2021).

Nature connectedness is often described as the subjective beliefs that a person has about their emotional connectedness with nature (DeVille et al., 2021). Nature connectedness can be further specified and divided into three components; nature exposure, and behavioural (time spent in nature); cognitive (thoughts about nature and sense of integration with nature); and affective (emotions and feelings towards nature) (Mayer & Frantz, 2004; Schultz, 2001, Nisbet et. al, 2009). Recently, two more dimensions of nature connectedness have been suggested; material (resource extraction and use) and philosophical (worldviews on nature); however mostly relevant for looking at human-nature connectedness on a societal scale (Ives et al., 2017, 2018).
1.6.2 Biophilic Values and the Biophilia Hypothesis

The theory on biophilic values is part of the biophilia hypothesis, originally formulated by Wilson (1984), and later developed by Kellert and Wilson (1993), that argues that humans have an innate tendency to have an affiliation for natural life, life-like processes and nature. This tendency is thought to stem from humans’ evolutionary history of spending time searching for survival enhancing environments, which created a love and awe towards survival enhancing nature. Since urban living is a relatively recent occurrence in humanity’s evolutionary history, the theory is that these feelings are still embedded in humans. In the biophilia hypothesis, nine succinct biophilic values are used to describe the range in which humans interact with or relate to nature. As earlier stated, five of these biophilic values; emotion, contact, meaning, beauty, and compassion; have been found to be strong pathways to nature connectedness by Lumber (2016) and Lumber et al. (2017). See table 1 below for definitions, and functions of the biophilic values and how those that operate as pathways are activated.

The original biophilia hypothesis has been criticized in its claim that human’s tendency for affiliation with nature is innate, which has been deemed as biologically deterministic (Bone, 2009) and the presented evidence for this has been criticized to lack in validity, reliability and statistical analysis (Schlinger, 1996:72-73), and for it to be untestable (Futuyama, 1979). However, many scientists claim the opposite and support the theory that humans need for affiliation with nature is innate (see for example Kahn, 1997, 2002; Nelson 1993; Levy 2003). An overview of the critique and the debate can be found in Joye and De Block (2011). Whether humans need for affiliation with nature is innate or not does however not affect the part of the Biophilia Hypothesis that suggest that humans interact with or relate to nature within the range of the nine biophilic values; or Lumber (2016) and Lumber et al. (2017) theory on five of the biophilic values as pathways to nature connectedness.

Table 1: The Nine Biophilic Values Out of Which Five Function as Pathways to Nature Connectedness

<table>
<thead>
<tr>
<th>Biophilic value</th>
<th>Pathway term</th>
<th>Definition</th>
<th>Activation</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Utilitarian</td>
<td>Practical use of material nature</td>
<td>Sustaining physical life and security</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Naturalistic</td>
<td>Pleasure from contact with nature</td>
<td>Development of mental, physical and outdoor skills</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ecologistic-Scientific</td>
<td>Scientific study of the interconnectedness of nature and natural systems</td>
<td>Observing nature, increasing knowledge and understanding</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aesthetic</td>
<td>Appeal of nature’s physical beauty</td>
<td>Feelings of security, inspiration and contentedness</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Symbolic</td>
<td>Expressing ideas through nature-based language and metaphors</td>
<td>Developing mentally, communicating with others/nature</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Humanistic</td>
<td>Emotional bond with, and love for nature</td>
<td>Companionship, bonding and co-operation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Moralistic</td>
<td>Ethical concern/judgements and revering nature</td>
<td>Moral reasoning, meaning of life, affiliation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dominionistic</td>
<td>Control and dominance of nature</td>
<td>Technological/mechanical skills, physicality, control</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Negativistic</td>
<td>Aversion, removal and fear of nature</td>
<td>Security and physical protection</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Adapted from Lumber et al. (2017:2), Lumber (2016:132), and Richardson et al. (2020a:389).
2. Literature Review

2.1 Benefits of Nature Connectedness

Nature connectedness has not only been shown to have a strong positive correlation with PEAB (Nisbet et al., 2009; Richardson et al., 2020b; DeVille et al., 2021), such as individual level climate-action (Galway et al., 2021); it also has a positive correlation with perceived value of nature; and perceived value of nature connectedness (DeVille et al, 2021). There is even a study where connectedness to nature explained 69% of variance in self-reported ecological behaviour in children, while environmental knowledge only explained an additional 2% (Otto & Pensini, 2017). Moreover, people with a stronger connectedness to nature, besides caring for and protecting it, also spend more time in nature (Whitburn et al., 2018; Lin et al., 2014; Nisbet et al., 2009). Conversely, unfamiliarity with nature may lead to devaluing and degrading it (Soga & Gaston, 2016).

Nature exposure, that has a strong positive correlation with nature connectedness, is linked to a wide range of positive effects such as increased learning, inspiration, eudaimonic well-being (happiness and contentment reached through experiencing a meaningful purpose and self-actualization in one’s life), health and general well-being, (Martin et al., 2020; Zelenski and Desrochers, 2021; Pritchard et al. 2020; Barnes et al., 2019; Capaldi et al., 2015, 2017; Russell et al. 2013, MacKerron & Mourato, 2013). Relationships with the natural environment are also essential to wellbeing from an indigenous perspective; land/territory can be a vital part of identity, spirituality, culture, worldviews, social relations, as well as material survival; people can see themselves as belonging to the land (Keaulana et al., 2021:1; Berkes, 1999/2017:296; Anguelovski & Martinez Alier, 2014).

2.2 Ways to Increase Nature Connectedness

Besides the aforementioned studies on the biophilic values of emotion, contact, meaning, beauty and compassion as key pathways to nature connectedness, other activities that have been found to increase nature connectedness that are in direct agreement with biophilic values are; engagement with natural beauty (Richardson & McEwan, 2018; Capaldi et al., 2017), congruent with the biophilic value beauty; being mindful of one’s surrounding when in nature, such as paying attention to the colour of leaves (Nisbet et al., 2019; Passmore & Holder, 2017) or noticing everyday nature (Richardson et al., 2016), the same as the biophilic value contact; eating wild plants (Richardson et al., 2016) compatible with contact; sharing what emotions nature evoked with friends (Richardson et al., 2016), coherent with emotion; and engaging artistically with the natural world in activities such as photography, narrative writing, and art work (Bruni et al., 2015; Muhr, 2020), which is in-agreement with the biophilic value meaning. In one of the interventional studies designed to create engagement with natural beauty, participants increased their nature connectedness after engaging with nature’s beauty every day for 30 days through assigned activities of for example noticing nature (such as watching a butterfly), congruent with emotion; sharing feelings and experiences in nature via social media, coherent with emotion; doing pro-nature behaviours (for example leaving a part of the garden wild), compatible with compassion; and connecting with nature through nature based arts, in coherence with beauty (Richardson & McEwan, 2018).

Nature exposure and immersive experiences have also been found to increase nature connectedness in adults (Nisbet et al., 2009; Soliman et al., 2017; Rosa & Collado, 2019; Martin et al., 2020; Zelenski & Desrochers, 2021; DeVille et al., 2021; Garip et al., 2021); as well as living near trees (Nisbet et al., 2020); and in children with immersive experiences and free outdoor play.
(Schneider & Schaal, 2017; Mullenbach et al., 2018; Vroegop, 2014); and enjoyment and play (Collado et al., 2013; Garip et al., 2021); all congruent with the biophilic value contact. Specific activities in nature that have been found to increase nature connectedness in adults are walking in natural settings (Mayer et al., 2009), hiking and camping (Martin, 2004), viewing wildlife and reflecting on the experiences (McIntosh & Wright, 2017); all in agreement with the biophilic values.

The five biophilic values have been investigated in adults by Lumber (2016) and Lumber et al. (2017). To activate these biophilic values as pathways to nature connectedness, different activities can be used, for example visits to nature with reflective writing or conversations. For example, in one study, Lumber et al. (2017) had participants take a walk in nature while activating the select biophilic values of emotion, contact, beauty, and compassion by making three stops; one where they were asked to converse with one another about their feelings and thoughts about the nature they had seen and the good things in it (activating emotion and beauty); one where they wrote down, for five minutes, the meaning of any symbolism in nature seen during the walk (activating meaning and beauty); and finally watching a nature conservation act video (to activate compassion and beauty). Participants that took part in the walk that activated the select biophilic values increased their nature connectedness more than that of the control group that just partook in walking. Another example of activating the select biophilic pathways was Lumber (2016) asking participants to spend 10 minutes per day in nature for six consecutive days and to each day write answers to the reflective questions “‘how does nature make you feel?’; ‘what meaning can you see in your own life through nature?’ and ‘why should nature be cared for or protected?’” (p. 124).

In relation to the biophilic values as pathways to nature connectedness it is interesting to note that Nyberg et al. (2019) found that affective connections; translated through expressions of symbolic meaning, beauty, emotions, memories, smell, colour, and size; seemed to be what attract humans to specific animals and plants; leading to their suggestion that “in biological education and conservation contexts we should rely more intentionally on cultural and personal factors, utilise pre-existing experience-based human-plant bonds, as points of departure for reinforcing recognition and appreciation of plants within educational contexts” (2019:42).

Knowledge-based outdoor experiences on the other hand, especially those with high information content, appear to have little or negative effect on Nature Connectedness (Hoke-Wood, 2020; Lumber et al., 2017; Bruni et al., 2015; Lumber, 2014; Kossack & Bogner, 2012). Hoke-Wood (2020) compared the effectiveness of different activities on increasing nature connectedness. Undergraduate students at a university in Canada were told to spend five minutes outside every day for two weeks; at random, students were told to either: 1.) just observe nature, 2.) look for birds, or 3.) look for and record sightings of birds. Albeit all groups experienced some improvements in connection to nature, environmental concern and mood; nature connectedness increased the most in participants asked to simply observe nature; making it the most effective intervention. That too high a focus on knowledge can be detrimental is also supported by Beery and Wolf-Watz (2014), who argue that the experiences in nature need to be direct and lead to forming a cognitive and/or affective relationship to increase nature connectedness. However, college students attaining an ecology course designed specifically to strengthen nature connectedness did increase their connectedness, while those attaining regular ecology courses did not (Lankenau, 2018). Congruently students taking part in a combined heritage and ecology excursion in the jungle in Singapore also increased their nature connectedness (Braun & Dierkes, 2016). The focus of the activity seems pivotal, whether taking place in nature or in a classroom, it needs to be designed in a way that increases connectedness to nature by activating cognitive and/or affective connections. Hence, it seems that if the content of education is aimed at increasing nature connectedness, this is possible, but if not; merely learning about ecology is not
effective; just as environmental or outdoor education in nature that is too knowledge or human-centred, is not.

In line with this, Mikael (2019), argues from a posthumanist perspective that the Swedish outdoor education ‘friluftsliv’ focuses too much on human-centred practices, and that this rather than challenging anthropocentric worldviews; beliefs such as that nature only exists for the benefit of humans; might be reinforcing them. Mikael contends that in these human-centred outdoor experiences, nature simply becomes a backdrop without actually being central. Similar to Lisberg Jensen and Ouis (2014:66) description of when nature is used solely as a ‘track’ for physical training. Mikael (2019) contends that “as teachers and outdoor educators, we need to assess whether our students are becoming actively engaged in learning in and with the land, or merely passing through it” (2019:87), suggesting that the focus should be on creating opportunities for learners to emotionally connect to nature. Similarly, Sjöblom (2012) argues that school education needs to focus more on getting students, of all ages, to feel good in nature; and that education should emphasize values central to students so that they can get closer to nature. Further, Wolff and Sjöblom (2016:39-41) assert that aesthetical perspectives on nature can support students value and meaning making processes, and contend that the aesthetics dimension of learning, where experience and understanding unites and evolves in reflection, contemplation, and dialogue; is an important part of learning. This is in line with utilising the five biophilic values as pathways to nature connectedness as frameworks within education and the earlier mentioned research and conclusions of Nyberg et al. (2019).

There is still not a lot of research done on interventions to increase nature connectedness and the existing research mostly concerns adults or children so there appears to be a gap in research here. A positive relationship between childhood experiences in nature and PEAB in adulthood have been seen (Wells & Lekies, 2006) as well as between childhood experiences and nature connectedness in adulthood (Beery, 2013). However, several interventional studies have managed to increase nature connectedness in secondary school students (for example Braun & Dierkes, 2016; Schneider & Schaal, 2017, Vroegop, 2014) and college/university students (for example Lankenau, 2018; Braun & Dierkes, 2016; Lumber et al., 2017) so even if it would turn out that it is easier to increase nature connectedness in children, it is still possible to affect in older students. And given the state of the planet, it is important to try to increase PEAB in all ages. As for Braun and Dierkes (2016), they performed a study on how nature excursions affect nature connectedness, that involved both 7–9-year-olds and 16-18-year-olds. Braun and Dierkes found that there seems to be a positive relationship between the length of excursions or treks in nature and nature connectedness; however, the effect of a one-day field-trips was higher on 16–18-year-olds than on young children (Braun & Dierkes, 2016). Hence, there is some support that one-day field-trips can have a positive effect on 16–18-year-old students’ nature connectedness, the age-group of the current study.

2.3 Measuring Nature Connectedness

Several researchers have set out to measure people’s feelings of kinship with or emotional connectedness with nature (see for example: Mayer & Frantz, 2004; Perrin & Benassi, 2009; Olivos et al., 2011; Cervinka et al., 2012; Fretwell & Greig, 2019; Wyles et al., 2019). Different tools to measure nature connectedness and related constructs have been developed; where quantitative approaches, mainly consisting of surveys containing psychometric scales; have dominated. Some of the most frequently used include the Nature Relatedness Scale (NR-21), The Connectedness to Nature Scale (CNS), and the Inclusion of Nature in Self Scale (INS) (Tam, 2013). Although a variation in definition of nature connectedness and its related constructs, and varying emphases on which
components to measure and how exists; a review has shown that concepts and tools for measurement strongly correlate (Tam, 2013). Recently however, it has been suggested that the multidimensionality of human-nature connectedness may not correspond entirely with these scales, since they only examine people's cognitive nature connections, do not allow for different mental models in their forced-choice questions, have inherent subjective definitions of nature, rely on self-report, and use language-based methods that might not be capable of uncovering intangible dimensions (experiences, emotions, spirituality) (Muhr, 2020). Hence, it has been suggested to use complementary qualitative methods, such as interviews and reflective papers; and to go ‘beyond words’ to investigate pre-verbal ways of knowing with arts-based methods (Muhr, 2020).

Muhr (2020) advocates triangulating qualitative, quantitative, and arts-based methods to expand the understanding of human-nature interrelation and interconnectedness. While recognizing challenges in data collection, interpretation, and representation; Muhr argues that incorporating the arts-based approach can reach embodied experiences and emotions often neglected in science; thereby transcending the cognitive and eliciting unspoken knowledge.
3. Theoretical Framework

The research project draws on a combination of Biophilic Values as Pathways to nature connectedness (BVPNC); Experiential Learning Theory (ELT); and the EYE for Sustainability Learning Tool. BVPNC serves as a rationale for, and as a theory to be tested in the proposed study. ELT is endorsed by UNESCO (2018:51) and is combined with BVPNC, as suggested by Lumber (2016:158-159), and the EYE-tool guided the design of the educational activities in the intervention. It is widely acknowledged that ESD should focus on active, participative and ELT methods that “engage the learner and make a real difference to their understanding, thinking and ability to act” (University of Plymouth, n.d.); which is congruent with the EYE-tool.

3.1 Biophilic Values as Pathways to Nature Connectedness

Following in table 2 are definitions of the five biophilic values that have been found to be strong pathways to nature connectedness in adults (Lumber, 2016; Lumber et al., 2017), descriptions of how to activate them and examples of activities for activation.

Table 2:
The Five Biophilic Pathways to Nature Connectedness and Their Activation

<table>
<thead>
<tr>
<th>Pathway</th>
<th>Definition</th>
<th>Activation</th>
<th>Examples of activities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Emotion</td>
<td>Creating an emotional bond with, and love for nature by feeling alive through the emotions nature brings. An affective state or sensation that occurs as a result of engaging with nature</td>
<td>Engage emotionally with nature, finding happiness, wonder, joy, calm, and noting the good things in nature. Embrace nature at times of sorrow.</td>
<td>Finding joy in wildlife at play, taking a moment to feel calm with nature. Find wonder in a spiders’ web. Reflect and share one’s feelings about nature with others.</td>
</tr>
<tr>
<td>Contact</td>
<td>Deriving pleasure from contact with nature by tuning in to nature through the senses. The act of meeting with nature through the physical senses</td>
<td>Notice and actively engage with nature, spending time fully experiencing nature with all one’s senses</td>
<td>Listening to birdsong, smelling wildflowers, watching the breeze in the trees, going barefoot, tasting the fruits of nature. Decorating with plants and natural materials.</td>
</tr>
<tr>
<td>Meaning</td>
<td>Finding meaning in one’s life by expressing ideas through nature-based language and metaphors. Using nature or natural symbolism to communicate a concept that is not directly expressed.</td>
<td>Explore and express how nature brings meaning to one’s life. Notice how nature appears in songs and stories, poems and art, how special places are natural spaces. Celebrate the mystery, signs, and cycles of nature</td>
<td>Create a story about a tree, map the journey of a bee, find folktales about nature, celebrate the longest day, the first swallow of summer or the first fall of leaves. Letting nature be one’s story.</td>
</tr>
<tr>
<td>Beauty</td>
<td>Realizing the appeal of nature’s physical beauty by noticing aesthetic qualities including shape, colour and form that please the physical senses.</td>
<td>Find beauty throughout the natural world. Take time to appreciate beauty in nature and engage with it through art or in words.</td>
<td>Create some wild art, paint the amazing colours of insects, take a photo of a flower, visit a place with an amazing view, look at nature photography.</td>
</tr>
<tr>
<td>Compassion</td>
<td>Extending the self to include nature, leading to a concern for other natural entities that motivates understanding and helping/co-operation. Showing ethical concern/judgements and revering nature by caring and taking action for nature.</td>
<td>Thinking about what one can do for nature. Take actions that are good for nature. Recognize shared life stories and be part of the community of nature.</td>
<td>Feed the birds, plant some wildflowers, take part in a scrap-picking activity, dig a pond, put up a nest box, watch a wild family grow. Support conservation charities, buy eco-friendly products.</td>
</tr>
</tbody>
</table>

Adapted from Lumber et al. (2017:2), Lumber (2016:132), Richardson et al. (2020:389), and Nature Connectedness Research Group (University of Derby) (n.d.).

It should be noted that the same activity can activate one or more of the biophilic values depending on the intent and the execution, moreover, sometimes it is difficult to separate the activation of the five different values. For example, touching a flower activates Contact; if you also notice the flower’s beauty, Beauty is activated. If you interpret the flower to be a symbol or showing or giving meaning to life, Meaning is activated. If touching the flower brings you joy or calmness, Emotion is activated. And finally, if you are touching the flower because you are caring for it or if touching it makes you think about caring for nature, Compassion is activated.
3.2 Experiential Learning (ELT)

In ELT learning can be defined as a process where knowledge is created in the process of transforming experiences, which results in an altered thinking and behaviour (Kolb, 1984:41). ELT was originally created by Dewey (1938/2015), later many variations have been developed, out of which Kolb’s (1984) Experiential Learning Model (ELM); later developed by Kolb et al. (2001); may be the most scholarly influential (Morris, 2020) and is applied in this study. In the ELM, learning is seen as an integrated cycle consisting of four major phases, each feeding into the next and all mutually supporting one another (see figure 1 below). As previously stated, Lumber (2016:158) endorses further research on and use of the biophilic values as pathways in education by combining them with ELT; contending that:

The pathways have the potential to create meaningful interactions with nature that immerse the individual within the complexity of nature and remove the notion of the separation of humanity and nature that education often implies (Antal & Drews, 2014), by forming a connected relationship through the pathways. The pathways as frames for engaging with nature would work to facilitate experiential learning as a core part of developing a connectedness to nature (Mace et al., 2012; Simiaka & Samways, 2010; Zelenski & Nisbet, 2012). (p. 158)

Lumber (2016:158) suggests the ELM cycle of experiences, reflective observation, abstract conceptualization, and active testing; can easily be combined with the biophilic pathways to facilitate nature connectedness in students; however emphasizing the “need to move beyond the traditional classroom context by having direct contact with nature, whether this is through field trips or within local spaces such as school fields, parkland” (p. 158). Lumber recommends activities that “focus on contact, forming an emotional bond, finding meaning and compassion for nature, and noticing beauty in order to encourage a connected relationship to form” (p. 159). Finally, Lumber concludes on combining the pathways and ELT that “Learning within natural spaces could be encouraged and linked into the scheme of work framed through the pathways to find solutions to real world issues where experiential learning would be essential” (p. 159). In the educational activities, this was implemented by an activity (Act for Nature) where participants identified an environmental problem and followed the ELM cycle, ending with testing an active solution they came up with to this problem, which also activated the biophilic value compassion by caring and acting for nature.
3.3 EYE for Sustainability Learning Tool

Tassone and Wals (2014) have created a heuristic learning tool for ESD in higher education, the ‘EYE (Educating Yourself in Empowerment) for Sustainability, based on pedagogies of transformative learning, empowerment, and emancipatory education; with the aim of equipping learners as change agents and awakening their personal engagement for sustainability by focusing on learning by and for participation, agency, and empowerment; which are central in ESD. This since Tassone and Wals consider the sustainability challenges of today to require new perspectives, both creative and critical; a reflexive self-consciousness; and new ways of being, seeing, and doing; a transformation of both individuals and society as a whole; which transformative learning can support. While emancipatory education supports development of creative and critical reflection on current sustainability issues, perspectives, and knowledge; whilst equipping and empowering learners to act. Finally, empowerment is about gaining power to, both in motivation and belief in, that one can act on and influence issues that the learner sees as important. This includes understanding how structural factors influence sustainability; and behaviours and actions taken to influence outcomes, leading sustainability actions, which is closely related to agency, in other words a change agent.

The tool is depicted as eyeglasses (see figure 2) for two reasons; firstly, since eyeglasses are also used to enhance vision in to accurately function in the world; secondly, it highlights the transformative quality in developing an eye for sustainability, stimulating the ability to visualise new approaches to achieve sustainability. The EYE comprises four interrelated, ongoing phases; understanding (the learner’s critical awareness and conceptual knowledge of sustainability issues is fostered and deepened), awakening (awakening personal agency, both enhancing learners capability to act on sustainability issues and working towards self-actualisation by educating them on and asking them to reflect on the impact that they have and the interconnectedness of the world), positioning (through dialogue and inquiry the learners position themselves in respect to what has been learnt and plan actions accordingly), enacting (engaging in real-life actions that contribute to sustainability). These stages were used in the educational plan in the Act for Nature activity.

Figure 2
EYE for Sustainability Learning Tool

4. Methods

4.1 Overview and Rationale of the Design

The study was carried out within an overarching framework of action research. The educational intervention was of quasi-experimental pretest-posttest nonequivalent comparison groups design (Fraenkel et al., 2019) utilising mixed-methods (MMR) consisting of a questionnaire containing the NR-21, CNS, INS, and a PEAB scale; reflective texts; interviews; and drawings to measure nature connectedness of intervention participants compared to a control group. Quasi-experimental nonequivalent comparison groups design is commonly used within educational evaluation research where intact groups often need to be used (Fraenkel et al., 2019: 269); and studies within action research on education has frequently used quasi-experimental design for this reason (see for example Vásquez et al., 2022; Thompson et al., 2015; Vollands et al., 1999); it is an efficient way to evaluate the effects of an educational intervention in real-life situations in schools, such as when researching one’s own practice, where random selection of participants is not an option (Fraenkel et al., 2019:542-543). Action research was a particularly fitting choice of methods for this project for two reasons. Firstly, it involved researching and developing my own practice, which is a major theme in action research (McNiff, 2013). Secondly, it was about researching if educational activities can be developed to increase upper secondary students’ nature connectedness and thereby their PEAB; which concerns a central topic in action research, namely sustainability (Reason and Canney, 2015).

MMR is also a commonly used method in ESD research and serves as an important bridge between disciplines, giving synergistic approaches to research design so that methods can inform one another (Reunamo & Pipere, 2011). Additionally, Muhr (2020:250) advocates an MMR approach of triangulating quantitative, qualitative, and arts-based methods; since quantitative survey-based methods alone are not enough to capture the multidimensionality of human-nature connectedness and that qualitative methods, while giving a deeper understanding, still need to be complemented with arts-based methods that go beyond words (uncovering new nuances of experiential and emotional connectedness with nature).

4.1.1 Critical Friends

Critical self-reflection over one’s practice and AR actions in dialogue with others are central in AR since it is about “learning in and through action and reflection” (McNiff, 2013:24). I engaged a social science teacher and one fellow ESD student as critical friends to discuss the research with. One upper secondary student acted as a critical friend to discuss the choice of educational activities with.

4.2 Participants

Since the study focused on my own practice, and out of convenience, participants for the intervention group (IG) were recruited from my own social science class. For the control group (CG), students were individually recruited from two social science classes in the grade above, these students were selected since most similar in characteristics (same place of stay, educational programme, current school and previous school background including experience with ESD, ethnicity, gender balance), only differing one year in age. Once the recruitment of IG participants was done, I wanted to purposely recruit the same number of participants and the same ratio of females and males for the CG from two classes of social science students in the grade above. Hence the male to female ratio was purposely selected, but after that, the individuals for the CG were randomly selected by lottery from
the two social science classes in the grade above. All of the approached randomly selected within purposeful gender ratio CG candidates agreed to participate in the study.

The upper secondary school is situated in an area of lower socioeconomic background than average in Sweden, the parents average schooling is an upper secondary degree (Skolverket, 2022).

The (IG), consisting of students from my own two social science classes, aged 16-17, had a total of 32 participants, 24 females and eight males, meeting the minimum requirement of 30 participants per group in an interventional study (Cohen et al., 2011:144, Fraenkel et al., 2019:102).

The (CG), consisting of students taking a social science class in the grade above, were aged 17-18, 32 in total, 24 females and eight males.

All of the participants answered the quantitative questionnaire. For the qualitative and arts-based methods, some selections were done, and these participants received pseudonyms. The two students with the highest, average, and lowest scores on the NR-21 scale pretest in the IG and CG respectively were purposely selected for interviews (a total of six students per group, 12 students in total); meeting Adler and Adler’s (2012) advice on minimum of participants; and Francis et al. (2010) suggestion of 5-6 samples; as well as being in line with Malterud et al. (2015) suggestion that assessments on sample size should consider the ‘information power’. Malterud et al. argue that a study with a narrow aim, highly specific criteria for selection of participants, a well-established theoretical base, data rich in detail, and in-depth analysis of detail; requires fewer participants. Additionally, the interviews, reflective texts, and drawings were collected to get an in depth understanding of participants nature connectedness; justifying a smaller sample (Charmaz, 1990). As for the drawings and reflective texts, the three students with the highest, average, and lowest scores on the NR-21 scale in each group were purposely selected (12 students per group, 24 students in total). These selections were done to decrease the workload while still obtaining qualitative and arts-based data from participants representing the lowest, average, and highest nature connectedness of the groups; making triangulation possible, for corroborating other findings and gaining a more complete view of participants nature connectedness (Clark et al., 2021:557).

4.3 Data Collection

The week after recruiting participants they answered an on-line questionnaire containing the different scales, wrote a reflection and created a drawing; all during regular school days with the researcher present; in order to measure their pre nature connectedness and PEAB. Before this, participants were reminded that participation was voluntary and could be interrupted at any time, as well as of the measures that were taken to guarantee confidentiality; participants were then continuously reminded about this throughout the project; especially before starting up the educational activities about four weeks after taking part in the measurements. The week after the educational intervention, the participants’ nature connectedness was measured again using the same instruments as before the educational intervention.

4.3.1 A Questionnaire Containing the NR-21, CNS, INS and PEAB Scale

The questionnaire was administered on-line, while the researcher was present in the classroom, with a total of 36-items comprising three of the established scales for measuring nature connectedness (Tam, 2013); the Nature Relatedness (NR-21) scale (Nisbet et al., 2009), the Connectedness to Nature Scale (CNS) (Mayer & Frantz, 2004), and the Inclusion of Nature in Self (INS) scale (Schultz, 2001, 2002). All three scales can be considered to have high content and construct validity since they are all established within the field since more than a decade (DeVille et
al., 2021); and since they have been found to correlate (Tam, 2013). Combining the three scales should further increase validity and avoid mono-method bias (Muijs, 2010).

4.3.1.1 NR-21

NR-21 aspires to measure an individual's affective, cognitive, and experiential connectedness to nature in a 21-item questionnaire, containing three sets of statements, where participants take a stand; using the five-point Likert-scale response alternatives (‘Strongly disagree’, ‘Disagree’, ‘Neither agree nor disagree’, ‘Agree’, ‘Strongly agree’.) (Nisbet et al., 2009:724-725). The affective section, NR-Self, contains nine questions that aim to measure the individuals' internalized identification with nature, their thoughts and feelings about their personal connection to nature. It contains items such as ‘My connection to nature and the environment is a part of my spirituality’. The cognitive dimension, NR-Perspective, consists of six questions and aspires to measure the individuals' external nature-related worldview, their sense of agency concerning the impact of individual human actions on all living things. An example item is ‘Humans have the right to use natural resources any way we want’. The experiential unit, NR-Experience, comprises six questions with the objective to measure the individuals' physical familiarity with nature and level of desire to and comfort with being out in nature; with items such as ‘I don’t often go out in nature’.

Nisbet et al. (2009) conducted two studies that showed support for the reliability and validity of the NR-21 scale; reliability was confirmed in that it was internally consistent, and temporally stable; criterion validity was shown in that it correlated with several environmental measures (concurrent validity), while not correlating with other measures such as vegetarianism, or pet ownership for example (discriminant validity) (Nisbet et al., 2009:731). As for reliability, Cronbach’s alpha showed internal consistency with the scores .87 for the full NR-21; and for the subscales NR-Self .84, NR-Perspective .66, and NR-Experience .80. Temporal stability was confirmed with test-retest correlations over a 6-to-8-week period showing .85 for NR-21; and for subscales NR-Self .81, NR-Perspective .63, and NR-Experience .85.

4.3.1.2 CNS

The CNS strives to measure people's degree of emotionally connectedness to the natural world and their perceived equality between themselves and nature with a 14-item questionnaire, also using the Likert-scale (Mayer & Frantz, 2004). Examples of items include: ‘I often feel a sense of oneness with the natural world around me.’, ‘I often feel disconnected from nature.’, and ‘I often feel a kinship with animals and plants.’ (Mayer & Frantz, 2004:513).

The CNS is well established within the field (Tam, 2013; DeVille et al., 2021) and correlates with other measurements of nature connectedness (Tam, 2013) and can therefore be considered to have high content and construct validity (Muijs, 2010). Mayer and Frantz (2004:512) conducted five studies and concluded that the CNS had good psychometric properties, they found strong evidence for the reliability and validity; it showed high internal consistency, and high temporal stability (high test-retest consistency); and it correlated with related variables and uncorrelated with potential confounds. Validity and reliability were confirmed by Perrin and Benassi (2009). The studies also confirmed that nature connectedness is a strong predictor of ecological behaviour (Mayer & Frantz, 2004).

4.3.1.3 INS

The INS scale is somewhat different, it lets participants choose between seven sets of figures of two circles overlapping to different extents (from not at all to completely), one of the circles representing nature, the other the participant (see figure 3 below) (Schultz, 2001, 2002).
As for the validity of the INS scale, being a single item measure its reliability and validity is limited, reliability cannot be measured; however, it has been found that when utilized in conjunction with other nature connectedness measures; such as the NR-21 for example; they inter-correlate, which indicates a conceptual overlap (Tam, 2013). Further, the INS is not burdened by any foundational psychometric issue (Tam, 2013), it has been found that for a single item measure it is unexpectedly precise when it comes to evaluating individual connection to nature (Brügger, et al., 2011). It can provide interesting information concerning participants’ self-reported subjective connectedness to nature.

Figure 3
The Inclusion of Nature in Self scale (INS)

Combining the scales was useful since each of them emphasize different aspects of nature connectedness, and the INS provided a different perspective with its singular question on choosing between figures; all together they provided greater coverage of the different aspects of nature connectedness.

4.3.1.4 PEAB Scale
The participants PEAB was measured with questions developed and tested for validity and reliability by Richardson et al. (2020b). Since the questions were developed for adults, questions that were deemed irrelevant for upper secondary students were not included; in instances when the UK appeared in the questions, this was replaced with Sweden. A total of eight questions segmented into two blocks, five specifically targeting pro-environmental attitudes (PEA), and three specifically measuring pro-environmental behaviour (PEB) were used. This questionnaire also used Likert-scale response alternatives. An example of a PEA question is: ‘Ensuring people have jobs in Sweden today is more important than protecting nature and wildlife for the future.’. An example of a PEB question is: ‘I have reduced the amount of meat that I eat.’.

4.3.2 Semi-structured Interviews
The semi-structured interviews were used to get a deeper understanding of the students’ nature connectedness since this format gives room for respondents to develop their answers; for follow-up inquiries, that might be key to understanding respondents answers; exploring themes beyond the preconceived questions, which could lead to obtaining information vital to the project; and to introduce, and clarify terms and questions to respondents, to avoid misunderstandings and increase
chances of relevant responses; while still keeping the central topic in focus, thanks to the structure provided by the pre-formulated questions (Brinkmann, 2020:286-287). This qualitative aspect was a good compliment to the more statistical data gathered by the questionnaire.

Since the interview topic is of a personal nature, the students were interviewed individually in-person, which allowed for greater confidentiality and made it easier to establish an atmosphere of trust, that enabled students to answer as freely as possible without being affected by group pressure from fellow students concerning norms on what to think and feel (Brinkmann, 2020:290-291). Further, in-person interviews provide better chances of establishing good rapport; make possible the use of visual signs such as smiles, nods et cetera, that can be helpful ways to get good responses; and allows noticing respondents body language, gestures, facial expressions such as smiles, and other emotional expressions such as trembles, laughs and crying (Walliman. 2006: 76-76; Brinkmann, 2020:291). The interviews were mainly guided by the most common style of interviewing, the receptive style, that empowers informants by using relatively open and relatively few questions, enabling respondents more control in how they answer (Brinkmann, 2020:292). The interviews were recorded for later transcription of essential sections, to make sure nothing important was missed, and short notes were taken during the interviews, mainly on visual signs, which enabled maintaining focus and attention on the respondent. The questions were designed to encourage respondents to be descriptive, in order to gain knowledge on how participants perceive their connectedness to nature, their relationship with nature (Brinkmann, 2020:287). Finally, when it comes to interviews, it is important as a researcher to clarify how meaning is looked upon (Brinkmann, 2020:289), in the current research project a combination of a constructionist approach, where interviews are seen as a dialogical process of meaning making that involves the interviewer as a co-constructor; and postmodern, transformative approaches that see interviews as performative and dialogic events where people have a chance to meet and co-create (Brinkmann, 2020:283,289), were applied.

4.3.3 Reflective Texts

The reflective texts that participants wrote individually were prompted by questions designed to give students the opportunity to contemplate their relationship with nature, what nature means to them, how they define nature, and their experiences (currently and in their child-hood) with nature. For both the pre and post reflective texts, participants were given time in class to write their reflection. The idea of using the reflective texts was, just as with the interviews, based on that they could provide further insight into the students’ complex human-nature relationship; their life-worlds; “the intersubjectively shared and meaningful world in which humans conduct their lives and experience significant phenomena” (Brinkmann, 2020:288).

4.3.4 Drawings

Participants were instructed to depict their connectedness to nature, their relationship to nature, by drawing this and commenting on what they aim to convey using the draw and write technique (Horstman et al., 2008) pre and post intervention. Participants were given a set of 12 wooden, different coloured pencils and a sheet of A4 drawing paper together with the instructions and had about one hour to complete the task (see Appendix G for full instruction).

4.3.5 Research Diary

I kept a research diary throughout the research process to record thoughts, feelings (on design, execution of activities, data collection and analysis, and discussions with critical friends) and observations during activities.
4.4 Data analysis

Both the collection and analysing of the data from the questionnaire followed established procedures for the different scales; NR-21 (Nisbet et al., 2011); CNS (Mayer & Frantz, 2004), INS (Schultz, 2001), PEAB scale (Richardson et al., 2020b). Normal distribution was established by creating bell curves and histograms. IG and CG pre-test data was compared using a series of t-tests. Even though sample size is small, t-Tests have been conducted on samples as low as four participants and the relevance for using it on smaller sample sizes tested and argued (de Winter, 2013; Morgan, 2017; Fraenkel et al., 2019:231).

The IG scores before and after the intervention was calculated and compared to CG by conducting a series of t-tests, to determine if the intervention affected the degree of nature connectedness and/or PEAB of IG; see further details below.

A content analysis following Roulston’s (2014) manual three step analysis was performed on the reflective texts and the transcribed interviews; the drawings content analysis was based on Gilbertson (2012). The pre-materials were compared to post-materials, looking for signs indicating a change in nature connectedness. As for the transcription of the interviews, context and delivery of dialogue (for example jokes, sarcasm, laughter, smiles, whispering); that were important for meaning-making; were included when this was key to how dialogue was to be understood (Roulston, 2014:299). This may lead to a richer representation of findings (Roulston, 2014:299).

When it comes to qualitative data interpretation, it is highly significant to acknowledge the challenge in that the researcher’s own pre-understandings can affect the process of making sense of the collected material (Roulston, 2014:302). The pre-understandings could cause the researcher to have a strong emotional response to details whose importance are therefore overestimated. To mitigate this, keeping this challenge in mind and going through the material several times is useful, so this was implemented. Still, it needs to be recognized that any analysis will entail that the data is only represented in part since choices have been made on which theoretical perspective to analyse it from and which aspects to focus on (Roulston, 2014:308).

4.4.1 The Questionnaire; calculating the NR-21, CNS, and INS and PEAB

For the NR-21 scale, the participant can score between one to five points on each question (from the Likert-scale ranging from ‘strongly disagree’ to ‘strongly agree’, depending on the statement the points are set as 1-5 or 5-1) for the total 21 questions; the average score (the total sum of the points from all questions divided by the total number of questions (21)) gave the participant’s degree of nature connectedness, the higher the score, the stronger nature connectedness (Nisbet et. al, 2011). The subcategory NR-Self is calculated from questions: 5, 7, 8, 12, 14, 16, 17, 20, 21; NR-Perspective is calculated from questions: 2, 3, 11, 15, 18, 19; and NR-Experience is calculated from questions: 1, 4, 6, 9, 10, 13.

To calculate the degree of nature connectedness for the CNS scale the procedure was the same as for the NR-21, except the CNS only contains a total of 14 items (Mayer & Frantz, 2004).

On the INS, the participant can score between one to seven (from choosing between the seven figures of circles overlapping to different degrees), the non-overlapping circles give a one, and the completely overlapping a seven which is the maximum nature connectedness (Schultz, 2001).

To calculate the PEAB score, the procedure was the same as for the NR-21 and the CNS, except only having a total of eight questions; out of which five were PEA and three PEB (Richardson et al., 2020b).
A series of t-tests were performed on the results from the pre-test post-test results on the scales to be able to determine if the IG nature connectedness and or PEAB was affected more than the CG.

### 4.4.2 Analysing Interviews and Reflective Texts

In the content-analysis of the reflective texts and transcribed interviews, manual three step analysis as proposed by Roulston (2014) was conducted. Statements describing participants' nature connectedness as well as PEAB, and depictions of experienced changes in these were noted and compared. The material was segmented into units that were meaningful in relation to answering the research question (Roulston, 2014:304). This was done in three steps. First, to reduce data, the entire material was read through while highlighting the most relevant parts. Secondly, to reorganize data, key statements representing general patterns in the data were detected and summarized. Finally, in data representation, the reorganized data served as reference points when generating results. In qualitative analysis, it is important to remain open to what appears in data instead of simply sticking to pre-assumed concepts (Roulston, 2014:305). It is also essential to make sure that the connection of the parts to the whole will be kept during the process of analysis, and to locate potential discrepancies, to increase chances of achieving this, data was reread and revisited several times (Roulston, 2014:306). The results from the interviews and the reflective texts were compared to the NR-21 scores.

### 4.4.3 Analysing Drawings

Analysing drawings is a highly interpretative process, a drawing is a reflection of its maker, it expresses both cognitive and affective aspects of their personality, giving it the potential to convey information both about the drawing and the maker (DiLeo, 1981:60). As Barrett (1994) phrases it “A work of art is an expressive object made by a person, and therefore, unlike a tree (or) a rock […] it is always about something” (p. 8). Therefore, the participants' drawings were analysed using both analytical content-analysis and a more subjective analysis that included interpretation of the drawings and their written description.

The content-analysis was conducted in three stages following the analytical method utilized by Gilbertson (2012) to analysed children's nature connectedness through their drawings. The first stage involved creating a coding chart to detail items featured within the drawings, this was done by first examining drawings to create a list of all depicted items and then sorting these to create thematic categories that could be used for analysis.

This content-coding was not based on interpretation but on recording of items and features, providing a more replicable analysis giving valid analysis. The content-analysis also looked into more intuitive aspects of the drawings, such as what could be seen from the overall tone, that is not always captured in details; these were also categorized into themes and included in the coding chart. After this, the drawings were re-examined to record the features and items in each drawing. In the second stage, predominant categories of items in the drawings were statistically tested to see if there was a difference in the type of categorized items and features, and the number of times that these were present within the drawings before and after the educational intervention. If the occurrence of nature items related to the five biophilic values of emotion, contact, beauty, emotion, and meaning increases after the educational intervention were higher, this was interpreted as an indication that nature connectedness may have increased, since these values are found to be related to nature connectedness (Lumber, 2016; Lumber et al., 2017). In stage three, the information on participants' nature connectedness collected from the drawings, before and after the intervention, were compared to the participants' results on the questionnaire, before and after the intervention, to see if these correlated (Gilbertson, 2012).
In the more subjective analysis of interpreting the drawings and their written description, the combination of drawing and narrative gave a more complete image of what participants intended to convey; such as the particular meaning of what is depicted to the participant; increasing clarity in analysis (Horstman et al., 2008). First, all drawings were laid out together on a floor to get an initial overview, as suggested by MacEntee and Mitchell (2011). Each of the drawings were then analysed by looking at the drawing in combination with reading the accompanying written description. The drawings and written descriptions were analysed to get a deeper view of how participants perceive their connectedness to nature and whether it appears to have changed after the intervention in IG or in CG post-test. Signs for this in the drawings could be for example a change in the use of symbols indicating emotions; or a decrease or increase in richness in detail and colour use, which could indicate a changed emotional and experiential relationship to nature; a stronger nature connectedness could be expected to show more detail and richness in colour since if having stronger nature connectedness, one could for example be spending more time in nature and pay more attention to it. Any representations relating to the biophilic values will also be recorded, since these correlate with nature connectedness, so an increase or decrease in these could indicate the same in a participant’s nature connectedness.

4.5 Intervention Environments and Activities to Activate Biophilic Values

An overview of the educational activities designed to activate biophilic values for increased nature connectedness that IG participants partook in is given in table three and four. Some photos of the redecorated indoor classroom and the outdoor environment are also presented.

Photos of the Redecorated Indoor Classroom, the Outdoor Environment and Planted Seedlings
<table>
<thead>
<tr>
<th>Biophilic Pathway</th>
<th>Description (descriptions based on Lumber (2016:143-153))</th>
<th>Activities</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Emotion</strong></td>
<td>Emotionally engaging with nature:</td>
<td>- Reflective writing: 1) Describe what is good about nature. 2) How does nature make you feel?</td>
</tr>
<tr>
<td></td>
<td>- Paying attention to the good things in nature.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Experiencing the calm and joy the good things in nature can bring.</td>
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<tr>
<td></td>
<td>- Sharing one's feelings about the natural world with others.</td>
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</tr>
<tr>
<td><strong>Contact</strong></td>
<td>Actively engaging with and noticing nature through the senses:</td>
<td>- Reflective writing: Describe the sensations you experienced in nature today and how they affected you.</td>
</tr>
<tr>
<td></td>
<td>- For example smelling wildflowers, listening to birdsong, watching the breeze in the trees, touching tree trunks, walking barefoot.</td>
<td>- Walks in nature</td>
</tr>
<tr>
<td></td>
<td>- Nature walks</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Smell herb plants in the classroom</td>
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<tr>
<td></td>
<td>- Listen to recorded sounds of birds and forests</td>
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<tr>
<td></td>
<td>- Eat berries</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Paying attention to all senses during visits to nature:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Touching trees and plants</td>
<td></td>
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<tr>
<td></td>
<td>- Looking at nature phenomena</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Listening to sounds in nature</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Actively smelling</td>
<td></td>
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<tr>
<td><strong>Meaning</strong></td>
<td>Focusing on meaning in nature:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Expressing and exploring how nature infuses life with meaning.</td>
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</tr>
<tr>
<td></td>
<td>- Exploring the appearance of nature in stories, songs, poems, art.</td>
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<tr>
<td></td>
<td>- Celebrating the cycles and signs of nature.</td>
<td></td>
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<tr>
<td></td>
<td>- Creating a story about a tree or a bee for example.</td>
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<tr>
<td></td>
<td>- Reflective writing: 1) Describe the meaning that you find in nature. 2) Describe a place in nature that is meaningful to you. 3) What meaning can you see in your own life through nature? 4) Describe the meaning that you find in nature when: a) Reading text from “Ten Million Aliens” (Barnes, 2015), b) Watching the film “Breaking Boundaries”</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Read excerpts from “Ten Million Aliens” (Barnes, 2015)</td>
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<tr>
<td></td>
<td>- Watch nature and sustainability movies</td>
<td></td>
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<tr>
<td><strong>Beauty</strong></td>
<td>Noticing the beauty in the natural world:</td>
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<tr>
<td></td>
<td>- Taking time to appreciate the beauty in nature.</td>
<td>- Nature walks</td>
</tr>
<tr>
<td></td>
<td>- Engaging with the beauty in nature through music, words, art.</td>
<td>- Taking photographs capturing beauty in nature</td>
</tr>
<tr>
<td></td>
<td>- Reflective writing: 1) Why nature should be protected and cared for. 2) Good actions that can be done for nature 3) A good action that you’ve done for nature 4) A good action that you can do for nature in the future. 5) After taking action: What did you do and how did it feel to take action for nature?</td>
<td></td>
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<tr>
<td></td>
<td>- Nature walks</td>
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<tr>
<td></td>
<td>- Reflective writing: 1) Why nature should be protected and cared for. 2) Good actions that can be done for nature 3) A good action that you’ve done for nature 4) A good action that you can do for nature in the future. 5) After taking action: What did you do and how did it feel to take action for nature?</td>
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<tr>
<td></td>
<td>- Watch nature and sustainability movie “Breaking Boundaries” (also Beauty and Meaning)</td>
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<td></td>
<td>- ACT for Nature: Take action to do something good for nature/environmental sustainability (example: act yourself/ yourselves (ex. pick up trash) or try to influence others (ex. students or decision makers; to make the school or municipality more environmentally friendly) via posters, social media, e-mail, video, art - group or individual activity)</td>
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<td></td>
<td>- Grow a plant from a seed (sunflower)</td>
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<tr>
<td><strong>Compassion</strong></td>
<td>Caring for nature:</td>
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<td></td>
<td>- Thinking about what actions can be taken for nature.</td>
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</tr>
<tr>
<td></td>
<td>- Taking action to do good for nature. For example: conservational acts (example: picking up trash, restoring nature), supporting charities or environmental organisations, rethinking shopping habits in favour of the environment.</td>
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</tr>
<tr>
<td></td>
<td>- Reflective writing: Describe: 1) Why nature should be protected and cared for. 2) Good actions that can be done for nature 3) A good action that you’ve done for nature 4) A good action that you can do for nature in the future. 5) After taking action: What did you do and how did it feel to take action for nature?</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Watch nature and sustainability movie “Breaking Boundaries” (also Beauty and Meaning)</td>
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<tr>
<td></td>
<td>- ACT for Nature: Take action to do something good for nature/environmental sustainability (example: act yourself/ yourselves (ex. pick up trash) or try to influence others (ex. students or decision makers; to make the school or municipality more environmentally friendly) via posters, social media, e-mail, video, art - group or individual activity)</td>
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</tr>
</tbody>
</table>

22
### Table 4:

**Overview of the Educational Intervention Plan to Activate Biophilic Values for Increased Nature Connectedness**

**Educational Intervention Activities to Activate Biophilic Values**

**Educational Environment Changes:** Pictures of beautiful nature scenery are hung on classroom walls (*Beauty*), plants, herbs, a small fountain, and two salt lamps are placed in the classroom (*Contact*). Classes were held outside when possible (activity and weather permitting) (*Contact*).

<table>
<thead>
<tr>
<th>Week</th>
<th>Lesson 1</th>
<th>Lesson 2</th>
<th>Lesson 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>9</td>
<td>Watch and discuss: “Breaking Boundaries: The Science of Our Planet” (documentary on ‘Planetary Boundaries’, the state of our planet, with nature and wildlife scenery) (Clay, 2021) (<em>Emotion, Meaning, Beauty, Compassion</em>)</td>
<td>Plant Sunflower Seeds (<em>Compassion, Meaning</em>); while listening to recorded birdsong (<em>Contact</em>)</td>
<td>Watch and discuss: “Our Planet: Episode 1: One Planet” (nature documentary that also informs about the state of the planet) (Fothergill et al., 2019) (<em>Emotion, Meaning, Beauty, Compassion</em>)</td>
</tr>
<tr>
<td></td>
<td><strong>Week Lesson 1</strong></td>
<td><strong>Lesson 2</strong></td>
<td><strong>Lesson 3</strong></td>
</tr>
<tr>
<td></td>
<td>Watch and discuss: ‘Love Thy Nature’ (documentary on humans interconnected relationship with nature) (<em>Meaning, Emotion, Beauty, Compassion</em>)</td>
<td>Write Reflection: a) What is good about nature? b) What does nature mean to me? c) Describe a place in nature that is meaningful to you d) Describe an event that took place in nature that is meaningful to you (<em>Meaning</em>); while listening to recorded birdsong (<em>Contact</em>)</td>
<td>Make a Photo Collage on the theme “Nature’s Beauty and/or Meaning and/or Goodness” (<em>Beauty, Emotion, Meaning</em>)</td>
</tr>
<tr>
<td>11</td>
<td></td>
<td>Smell herbs and plants kept in the classroom (<em>Contact</em>), write about how it makes you feel and what it makes you think of.</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Read and discuss excerpt from “Ten Million Aliens” (Barnes, 2015) (on how all beings in nature are interconnected and of equal worth) (<em>Meaning</em>)</td>
<td>Outside the whole lesson: ‘Sensory Walking’ - pay attention to what you see, hear, smell and touch in nature (20 min) (<em>Contact, Beauty, Meaning</em>). Think about what’s good about nature (10 min) (<em>Meaning</em>). Meditation in nature: 1) For 3 minutes, listen, smell, touch and look at nature around you (<em>Contact</em>), 2) In turn, think for 3 minutes about: a) That when you breathe, you are part of a life cycle with trees and other plants exchanging carbon-dioxide and oxygen; that plants and trees make our existence possible. (<em>Emotion</em>) b) The joy and good things that nature brings. (<em>Emotion, Meaning</em>) c) Nature’s beauty (<em>Beauty</em>) d) The good things you can do for nature (<em>Compassion</em>). (15 min)</td>
<td>Start group work on “ACT for NATURE” (plan and execute an action that increases environmental sustainability) (<em>Care</em>)</td>
</tr>
<tr>
<td>13</td>
<td>Outdoor Sports Day (<em>Contact</em>) (General Activity for the Whole School; choice of activities: fishing, skiing, snowmobile, walking and indoor swimming combined)</td>
<td>‘Sensory Walking’ - pay attention to what you see, hear, touch and smell in nature (10 min) (<em>Contact, Beauty, Meaning</em>). Think about what’s good about nature (5 min) (<em>Meaning</em>). Taste raspberries (<em>Contact</em>)</td>
<td>Attentive Walking &amp; Photography - pay attention to the nature around you and take photos of things that you find beautiful and/or meaningful and/or care for and/or make you feel good. (10 min) (<em>Contact, Beauty, Meaning, Emotion (Compassion</em>))</td>
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<tr>
<td></td>
<td><strong>Outdoor Sports Day</strong> (Contact) (General Activity for the Whole School; choice of activities: fishing, skiing, snowmobile, walking and indoor swimming combined)</td>
<td><strong>Continue group-work on ACT for NATURE</strong> (45 min) (<em>Compassion</em>)</td>
<td><strong>Continue group-work on ACT for NATURE</strong> (45 min) (<em>Compassion</em>)</td>
</tr>
</tbody>
</table>
4.6 Ethical Considerations

Ethics were considered during the entire research process; when deciding on what to research, before carrying out the research (analysing what ethically complex situations might occur and preparing for these (Preissle et al., 2011)), during the research the Swedish Research Council’s (2017) ethical guidelines were followed (obtaining consent from the principal, making sure participants were safe (voluntary, de-identified in data including given pseudonyms, informed orally and in a written consent letter about voluntary participation, what the data was to be used for, their anonymity and the possibility of discontinuation at any time) and research reliability and validity ensured. The concept of responsive ethics (Amundsen & Msoroka, 2019); where ethical decisions are transparently negotiated between the institutions'/universal, participants’, and researchers’ personal ethical principles; guided the research. Responsive ethics enables more meaningful, transparent and more flexibility in practice for educational research. Since a high sense of nature connectedness is related to many positive effects on physical and mental well-being, participating in educational activities aimed at increasing this was not assumed to be involved with any foreseeable increased risk of mental or physical harm. Given that participants were in a hierarchical student-teacher relationship to the researcher, extra care was taken to ensure that students participation was voluntary and could be discontinued at any time. This was done by continuously reminding students about this throughout the project and keeping the research process transparent. The data from students was de-identified by assigning them numbers, making sure all data was only labelled with the number, and keeping the name-number key stored on one piece of paper in the researcher's home office and destroying this paper and data after the publication of the thesis.

From the perspective of inclusive pluralism (Kopnina & Cherniak, 2016) it was relevant to explore how education could increase students embracing of inclusive pluralism; in this case in the form of an educational intervention designed to increase students’ nature connectedness; in other words, their understanding and appreciation of more-than-human-interests; and thereby their PEAB, their attitudes and actions benefiting the more-than-human-world. Hence, the research and the educational sections of it were deemed to be in-line with inclusive pluralism.

In relation to this, it is of essence to acknowledge that there are ESD researchers that consider it unethical to try to influence children’s and young adults’ PEAB, based on arguments of the right to personal freedom and freedom of choice (see for example Ideland & Malmberg, 2014; Franck, 2017; Franck & Osbeck, 2018). However, concerning sustainability and PEAB, there is not really a choice to be made as in other moral issues that only concern the individual, since, considering the state of the planet, it concerns maintaining the basic conditions for all life. Therefore this argument does not stand, because if person A should be allowed to live unsustainably (for example polluting the air or admitting carbon dioxide), leading to person B not being able to live what they consider a good life (for example the access to clean air), or to live at all; in fact, person B has been robbed of their free choice. This is the basis of all freedom, constraints are necessary to give freedom; as Nussbaum (2003) puts it “any particular freedom involves the idea of constraint: for person T is only free to do action A if other people are constrained from interfering with A” (p. 44). Neither of the aforementioned researchers that argue that attempts to influence children’s PEAB, based on the right to personal freedom and free choice; consider how the children’s choices and actions could interfere with other children's possibility of choice; which could be considered imperialist and colonialist since the major part of unsustainability problems are caused by the rich people of the world, while the poor are left with the bulk of the consequences (Steffen et al., 2015); or that this unsustainable way of living and overuse of resources is only made possible by exploiting other people, species and parts of the planet in a
historical and ongoing colonial oppression (Gottschlich & Bellina, 2016; Andreucci & McDonough, 2015; Warlenius et al., 2015; Malm & Hornborg, 2014). Neither do they consider how the children’s choices affect plants and animals; which could be considered speciesist and anthropocentric (see for example Oakley, 2019; Dinker & Pedersen, 2016; Kopnina & Cherniak, 2016), and unfair from a posthumanist perspective (Affifi, 2020); or how they affect coming generations of beings, either human or non-human. If conditions on planet earth are made unsuitable for most species, the possibility of choice will effectively have been removed for many, making it impossible to argue the right of some to make unsustainable choices, based on the idea of right to personal freedom and choice.

Moreover, there are many scholars that argue that influencing people's attitudes towards nature and sustainability is pivotal to achieve sustainability (see for example Keaulana et al., 2021; Muhr, 2020; Soga & Gaston, 2016; Zylstra et al., 2014; Miller, 2005). Miller (2005) for instance, argues that it is necessary that we strive to influence people to care for nature and make it a central part in their life in order to achieve sustainability. Hence, the suggested research topic; utilising biophilic pathways to increase Nature Connectedness in upper secondary students; is considered ethical from the view-point of the researchers ethical positioning within inclusive pluralism, which is also in-line with posthumanist ideas.
5. Results

5.1 Questionnaire; NR-21, CNS, INS, and PEAB Scales

Pretest Results

The IG (n = 32) and CG (n = 32) had the same proportion of females and males (24 females and 8 males per group) as well as of actively competing cross-country skiers (12 per group) and alpine skiers (5 per group) respectively, and the IG and CG participants attended the same proportions of the preparatory university programs of economics (10 per group), natural sciences (14 per group), and social sciences (8 per group). The only characteristics that differed was that the CG was on average one year older (17 years old) than the IG (16 years old).

The data was screened for kurtosis, skewness, and outliers with all falling within acceptable parameters. A series of independent samples t-tests revealed that there were insignificant differences, and insignificant effect size measured as Cohen’s d, between the IG and CG at the pretest on the scales; except for the CNS that had low to medium significant differences as well as effect size (Cohen’s d). The insignificant difference was for example seen in the pre-NR. There were insignificant differences between the IG and CG at the pretest NR-21 (p = .039). The pre-NR-21 mean of the IG (M = 3.46, SD = 0.44, n = 32) was very similar to the CG mean (M = 3.49, SD = 0.41, n = 32), the difference between the groups was negligible, t (62) = -0.29, p = .039 (1 tail), d = -0.07. See table 5 for the full pre-test results comparisons.

Table 5: Pretest Descriptive Statistics and Independent Samples T-Test Comparison of the IG and CG

<table>
<thead>
<tr>
<th></th>
<th>IG (n = 32)</th>
<th>CG (n = 32)</th>
<th>t</th>
<th>d</th>
</tr>
</thead>
<tbody>
<tr>
<td>NR-21</td>
<td>3.46</td>
<td>3.49</td>
<td>-0.29</td>
<td>0.07</td>
</tr>
<tr>
<td>NR-Self</td>
<td>3.23</td>
<td>3.29</td>
<td>-0.35</td>
<td>0.10</td>
</tr>
<tr>
<td>NR-Perspective</td>
<td>3.89</td>
<td>3.93</td>
<td>-0.32</td>
<td>0.08</td>
</tr>
<tr>
<td>NR-Experience</td>
<td>3.30</td>
<td>3.30</td>
<td>-0.02</td>
<td>0.00</td>
</tr>
<tr>
<td>CNS</td>
<td>2.92</td>
<td>3.09</td>
<td>-1.41</td>
<td>0.35</td>
</tr>
<tr>
<td>INS</td>
<td>3.63</td>
<td>3.72</td>
<td>-0.30</td>
<td>0.07</td>
</tr>
<tr>
<td>PEAB</td>
<td>3.42</td>
<td>3.45</td>
<td>-0.20</td>
<td>0.05</td>
</tr>
<tr>
<td>PEA</td>
<td>4.08</td>
<td>4.05</td>
<td>0.29</td>
<td>0.10</td>
</tr>
<tr>
<td>PEB</td>
<td>2.73</td>
<td>2.85</td>
<td>-0.51</td>
<td>0.13</td>
</tr>
</tbody>
</table>

Posttest Results

In the posttest, the IG increased their NR-21 mean by 0.41 (SD 0.50) while the CG only increased their mean by 0.03 (SD 0.43). Paired samples t-tests on the pre and post NR-21 scores of the IG, and CG respectively, were conducted to investigate the effect of the intervention on nature connectedness. The IG showed a significant increase in NR-21 (t (31) = -7.51, p = .000, (one tailed) r = .78) while the CG (t (31) = -0.44, p = .332, (one tailed) r = .84) did not significantly increase their NR-21. The same was seen for the CNS, INS and PEAB scale respectively (see details below).

The IG showed a significant increase in CNS (t (31) = -5.52, p = .000, (one tailed) r = .34) while the CG (t (31) = -0.23, p = .411, (one tailed) r = .48) did not significantly increase their CNS. The IG showed a significant increase in INS (t (31) = -6.14, p = .000, (one tailed) r = .86) while the CG (t (31) = 0.00, p = .500, (one tailed) r = .65) did not significantly increase their INS (unchanged).
The same was also seen in the subcategories of the NR-21. The IG showed a significant increase in NR-Self \((t (31) = -5.87, p = .000, \text{one-tailed} \ r = .76)\) while the CG \((t (31) = -0.92, p = .183, \text{one-tailed} \ r = .71)\) did not significantly increase their NR-Self. The IG showed a significant increase in NR-Perspective \((t (31) = -3.77, p = .000, \text{one-tailed} \ r = .58)\) while the CG \((t (31) = 1.36, p = .092, \text{one-tailed} \ r = .73)\) did not significantly increase their NR-Perspective, it decreased slightly. The IG showed a significant increase in NR-Experience \((t (31) = -4.91, p = .000, \text{one-tailed} \ r = .63)\) while the CG \((t (31) = -1.34, p = .095, \text{one-tailed} \ r = .70)\) did not significantly increase their NR-Experience.

As for PEAB, the IG showed a significant increase in PEAB \((t (31) = -7.01, p = .000, \text{one-tailed} \ r = .66)\) while the CG \((t (31) = 0.11, p = .457, \text{one-tailed} \ r = .58)\) did not significantly increase their PEAB, it remained almost unchanged, it decreased insignificantly. Concerning the PEAB subcategories, the IG showed a significant increase in PEA \((t (31) = -2.05, p = .024, \text{one-tailed} \ r = .50)\) while the CG \((t (31) = 0.85, p = .200, \text{one-tailed} \ r = .56)\) did not significantly increase their PEA, it remained almost unchanged, it decreased insignificantly. The IG showed a significant increase in PEB \((t (31) = -6.60, p = .000, \text{one-tailed} \ r = .75)\) did not significantly increase their PEB, it was almost unchanged, it decreased insignificantly.

A series of independent samples t-tests were run to compare the post-means of the IG to the post-means of the CG. These confirmed that the IG had increased their means significantly more than the CG and that the effect sizes measured as Cohen’s \(d\) ranged from medium to large (see table 7).

### Table 6:
**Pretest Posttest Descriptive Statistics and Paired Samples T-Test Comparison of the IG and CG**

<table>
<thead>
<tr>
<th></th>
<th>IG (n = 32)</th>
<th></th>
<th></th>
<th>CG (n = 32)</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pre-M</td>
<td>Post-M</td>
<td>(t)</td>
<td>Pre-M</td>
<td>Post-M</td>
<td>(t)</td>
</tr>
<tr>
<td>NR-21</td>
<td>3.46 (.44 SD)</td>
<td>3.87 (.50 SD)</td>
<td>-7.51</td>
<td>3.49 (.41 SD)</td>
<td>3.51 (.43 SD)</td>
<td>-0.14</td>
</tr>
<tr>
<td>NR-Self</td>
<td>3.23 (.60 SD)</td>
<td>3.67 (.61 SD)</td>
<td>-5.87</td>
<td>3.29 (.60 SD)</td>
<td>3.36 (.60 SD)</td>
<td>-0.92</td>
</tr>
<tr>
<td>NR-Perspective</td>
<td>3.89 (.46 SD)</td>
<td>4.19 (.53 SD)</td>
<td>-3.77</td>
<td>3.93 (.58 SD)</td>
<td>3.82 (.60 SD)</td>
<td>1.36</td>
</tr>
<tr>
<td>NR-Experience</td>
<td>3.30 (.62 SD)</td>
<td>3.77 (.63 SD)</td>
<td>-4.91</td>
<td>3.30 (.65 SD)</td>
<td>3.42 (.62 SD)</td>
<td>-1.34</td>
</tr>
<tr>
<td>CNS</td>
<td>2.92 (.41 SD)</td>
<td>3.43 (.48 SD)</td>
<td>-5.52</td>
<td>3.09 (.56 SD)</td>
<td>3.12 (.53 SD)</td>
<td>-0.23</td>
</tr>
<tr>
<td>INS</td>
<td>3.63 (1.10 SD)</td>
<td>4.34 (1.07 SD)</td>
<td>-6.14</td>
<td>3.72 (1.50 SD)</td>
<td>3.72 (1.22 SD)</td>
<td>0.00</td>
</tr>
<tr>
<td>PEAB</td>
<td>3.42 (.57 SD)</td>
<td>3.96 (.42 SD)</td>
<td>-7.01</td>
<td>3.45 (.63 SD)</td>
<td>3.45 (.50 SD)</td>
<td>0.11</td>
</tr>
<tr>
<td>PEA</td>
<td>4.08 (.46 SD)</td>
<td>4.24 (.39 SD)</td>
<td>-2.05</td>
<td>4.05 (.51 SD)</td>
<td>3.97 (.56 SD)</td>
<td>0.85</td>
</tr>
<tr>
<td>PEB</td>
<td>2.73 (.47 SD)</td>
<td>3.64 (.55 SD)</td>
<td>-6.60</td>
<td>2.85 (.90 SD)</td>
<td>2.70 (.81 SD)</td>
<td>1.33</td>
</tr>
</tbody>
</table>

### Table 7:
**Posttest Statistics and Independent Samples T-Tests Comparison of the IG and CG**

<table>
<thead>
<tr>
<th></th>
<th>IG (n = 32)</th>
<th></th>
<th></th>
<th>CG (n = 32)</th>
<th></th>
<th>(t)</th>
<th>(d)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
<td>SD</td>
<td>M</td>
<td>SD</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NR-21</td>
<td>3.87</td>
<td>.50</td>
<td>3.51</td>
<td>.43</td>
<td>3.10 (.p .001)</td>
<td>1.18</td>
<td></td>
</tr>
<tr>
<td>NR-Self</td>
<td>3.67</td>
<td>.61</td>
<td>3.05</td>
<td>.6</td>
<td>2.08 (.p .021)</td>
<td>.86</td>
<td></td>
</tr>
<tr>
<td>NR-Perspective</td>
<td>4.19</td>
<td>.53</td>
<td>3.82</td>
<td>.6</td>
<td>2.58 (.p .006)</td>
<td>.65</td>
<td></td>
</tr>
<tr>
<td>NR-Experience</td>
<td>3.77</td>
<td>.63</td>
<td>3.42</td>
<td>.62</td>
<td>2.22 (.p .015)</td>
<td>.56</td>
<td></td>
</tr>
<tr>
<td>CNS</td>
<td>3.43</td>
<td>.48</td>
<td>3.12</td>
<td>.53</td>
<td>2.46 (.p .008)</td>
<td>.61</td>
<td></td>
</tr>
<tr>
<td>INS</td>
<td>4.34</td>
<td>1.07</td>
<td>3.72</td>
<td>1.22</td>
<td>2.18 (.p .017)</td>
<td>.54</td>
<td></td>
</tr>
<tr>
<td>PEAB</td>
<td>3.96</td>
<td>.42</td>
<td>3.45</td>
<td>.50</td>
<td>4.46 (.p .000)</td>
<td>1.10</td>
<td></td>
</tr>
<tr>
<td>PEA</td>
<td>4.24</td>
<td>.39</td>
<td>3.97</td>
<td>.56</td>
<td>2.20 (.p .016)</td>
<td>.56</td>
<td></td>
</tr>
<tr>
<td>PEB</td>
<td>3.64</td>
<td>.55</td>
<td>2.70</td>
<td>.81</td>
<td>5.41 (.p .000)</td>
<td>1.36</td>
<td></td>
</tr>
</tbody>
</table>
Thus we can draw the conclusion that the nature connectedness and PEAB of the IG increased significantly while the nature connectedness and PEAB of the CG did not.

5.2 Individual Examples Based on Interviews and Reflective Texts

The two participants with the highest (Freja, Vera), average (Erik, David), and lowest (Emma, Erika) pre-NR-21 scores in the IG and the two with the highest (Madeleine, Klara), average (Elsa, Evelina), and lowest (Karl, Anna) pre-NR-21 scores in the CG were interviewed pre and post the intervention (twelve in total); they also wrote reflective texts pre and post, as did an additional participant per level of pre-NR-21 scores in the IG (Highest: Sara, Average: William, Lowest: Alfred) as well as the CG (Highest: Hanna, Average: Tilde, Lowest: Anders). Here the results from the pre and post interviews and reflective texts are presented both grouped by the level (the highest, average, and lowest pre-NR-21 scores) and individually per participant. Results are presented this way to make it possible to compare their nature connectedness and PEAB as well as discern any signs of changes post intervention; both within the groups and for the individual participants.

Similarities Between Participants Pre Intervention

In common for almost all (twelve in total) interviewed participants (except Anna, who did not have a favourite spot) is that their favourite spot in nature is a place that they spent time in when growing up, usually with family and or relatives. All of the four interviewed participants with high pre-NR-21 scores and some with average scores, associated nature with socialising and having a good time with their family and friends. All of the high pre-NR-21 participants spent a lot of time in nature when growing up, and all except Klara still spent a lot of time in nature. While most of the low NR-21 participants did not spend a lot of time in nature when growing up or currently.

Almost all of the interviewed participants saw nature as a calm place where they could relax and destress (except for two low pre-NR-21 participants; Anna, who did not feel like nature had any effect on her, and Karl who just mentioned that it made happy). Three out of the six participants that had not been interviewed also mentioned this calming effect in their pre-reflective texts (CG high pre-NR-21: Hanna, IG average pre-NR-21: William, and CG average pre-NR-21: Tilde).

Signs of Changed Nature Connectedness Post Intervention

In the post interviews and reflective texts, all the CG participants had in common that when asked about their nature connectedness and their sustainability views and actions, they all claimed that this remained unchanged, they described feeling the same and acting the same. Most of the interviewed IG participants on the other hand reported an increased nature connectedness (four out of six), the other two showed an increased nature connectedness in their increased valuing of nature and motivation to act sustainably. All the three participants that only wrote reflective texts also showed and increased nature connectedness in their valuing of nature and or motivation to act sustainably. Additionally, four of the IG participants reported an increase in sustainability actions.

Among the IG pre-NR-21 high, Vera described feeling an increased sense of nature connectedness and now seeing herself as a part of nature, and all the IG high pre-NR-21 participants (Freja, Vera, Sara) described feeling strengthened to continue to live sustainably. Sara also described acting more sustainably. Two of the IG average pre-NR-21 participants, Erik and David felt a slight increase in nature connectedness and Erik went from not seeing himself as a part of nature to doing so, David now sees himself as in between a part of nature and not (increase from being sure he was not). William did not feel more connected to nature and was still unsure if he was a part of nature or not, however he did show signs of increased nature connectedness in expressing that he valued nature
higher. All the three average scoring pre-NR-21 participants showed an increased motivation to act sustainably and had increased their sustainability actions. Among the three IG participants with the lowest pre-NR-21, Erika expressed a slightly increased nature connectedness and now saw herself as a part of nature instead of separate as before the intervention. Emma and Alfred felt that their nature connectedness was the same but although Emma’s NR-21 score remained unchanged and Alfred’s almost unchanged, both expressed valuing nature higher, which is a sign of increased nature connectedness. Emma was still unsure if she was a part of nature but felt a belonging to it, Alfred was still sure he was not a part of nature. All three low pre-NR-21 IG participants expressed an increased motivation to act sustainably although none had started acting sustainably.

Thus we can draw the conclusion that the nature connectedness and PEAB of the IG increased while they remained unchanged for the CG.

Table 8:
The Post Intervention Increase in Nature Connectedness and PEAB in the IG Based on Interviews and Reflective Texts

<table>
<thead>
<tr>
<th>Highest Pre-NR-21</th>
<th>Average Pre-NR-21</th>
<th>Lowest Pre-NR-21</th>
</tr>
</thead>
<tbody>
<tr>
<td>Freja*</td>
<td>Vera</td>
<td>Sara*</td>
</tr>
<tr>
<td>Increased Nature Connectedness</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>-Self experienced</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>-Valuing nature higher</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>-Increased PEA/PEAB</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Increased PEAB</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>-Increased PEA</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>-Increased PEB</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>

*= Freja and Sara already saw themselves as a part of nature pre intervention.

Comparison of the Six Participants with the Highest Pre-NR-21 Scores

Five of the six participants with the highest nature connectedness on the pre-NR-21 were cross-country skiers, all were female. Three of the four interviewed participants (all except for Klara) had in common that they spent a great deal of time in nature with their parents as they were growing up; and that their parents taught them to cherish, value and care for nature by the way that they acted in nature and talked about nature. They also had in common that they all still spend a lot of time in nature in their everyday lives and that when they have a leave, they frequently go visit their parents to spend time in nature with them. Klara however did not spend time in nature with her parents but with her preschool and elementary school teachers, which might have filled the same function. Klara was the only one with high pre-NR-21 that did not spend time in nature regularly. It seems that spending time with family and or teachers in nature is important to these participants, and spending time in nature is often described as a very social event, although they also use nature to relax and destress on their own. Spending time in nature currently was associated mainly with relaxation, destressing; and for all but Klara, socialising and having a good time with family and friends. Spending time in nature was also partly connected with utility purposes such as picking berries, fishing, and doing work on the family farm; for Freja, Vera and Madeleine that still spent a lot of time in nature. They all had strong memories of places and experiences in nature that they could recall when asked. Sara and Hanna, that was not interviewed, also described spending a lot of time in nature in their everyday life.
All of these six participants saw themselves as very connected to nature. Four out of six also saw themselves as a part of nature (all except for Vera and Klara). They also had in common that they thought about sustainability in their daily lives and to some or a large extent considered sustainability in their daily life actions and choices, for example making sustainable food choices, recycling, using public transportation or carpooling. They were also open to making further lifestyle changes if this was required in order to protect nature and wildlife.

Five of the pre-NR-21 high nature connectedness participants were actively competing in cross country skiing (all except Klara) and described that their relationship with nature had partly changed from when they were growing up, now they spent most of their time in nature training instead of during play. All of the high pre-NR-21 participants; except for Freja, the girl with Sami (indigenous people) background; thought that they spent less time in nature now than when they were growing up.

After the intervention, all three of the CG participants (Madeleine, Klara, Hanna) claimed that their nature connectedness, their sustainability views and actions, remained the same. Among the IG participants however, Vera, expressed an increase in nature connectedness, a greater motivation to continue to act sustainably and a slight increase in acting sustainably. Freja, said that her nature connectedness remained as strong as before but that she had learnt more about sustainability problems, which had increased strengthened her motivation to act sustainably. Sara wrote in her reflection that her motivation to act sustainably and also her sustainability actions had increased.

Comparison of the Six Participants with Average Pre-NR-21 Scores

These participants had scores indicating an in between neutral and rather high nature connectedness and all spent quite a lot of time in nature, just as the highest pre-NR-21 scorers. Four of them spent a lot of time in nature when training (Erik, David, William, Evelina) and all of these spend time in nature outside of training except for Evelina. The other two mostly spend time in nature during walks and when visiting cabins with their families (Elsa, Tilde). They all seem to have spent some time in nature with their parents when growing up, but non mention activities or conversations with their parents that instilled the same kind of appreciation and caring relationship with nature as the highest pre-NR-21 participants. Among the training ones, Erik seems to be the one that spends the most time in nature outside of training. It seems they all tend to correspond well with their pre-NR-21 score; they see themselves as medium connected to nature, value nature, but do not see themselves as a part of nature. Three out of six think about and act sustainably to some extent (Erik, William, Elsa), however William only to a low degree. All except Evelina can consider making some lifestyle changes in the future to increase sustainability, for protecting nature. In common with the highest pre-NR-21 participants is that they all feel relaxed from being in nature.

In the post-interviews and reflections, the three CG participants claimed that their nature connectedness, their sustainability views and actions, remained the same. Among the IG participants, both David and Erik felt an increased nature connectedness and acted a little more sustainability and thought about sustainability issues more. William did not feel more connected to nature but described valuing nature higher and increased sustainability motivation and action, signs of increased nature connectedness.

Comparison of the Six Participants with the Lowest Pre-NR-21 Scores

Most of the participants with the lowest pre-NR-21 scores do not spend that much time in nature on a regular basis except for two participants; Karl that does his alpine skiing training in nature, however usually in a ski slope which does not guarantee interaction with nature that activates the five biophilic values; and Anders that does cross-country skiing training. Alfred sometimes spends time in
nature on his dirtbike, which neither guarantees activation of the five biophilic values (nature can become a backdrop and something to be utilised). The interviewed low pre-NR-21 participants did not seem to spend much time with their parents in nature during their childhood. Five of them considered themselves as medium connected to nature while Alfred did not feel connected to nature and five out of six saw themselves as separate from nature, all except for Anders. Three out of six thinks that nature makes them relaxed; among the other two, Karl thought it made him happy and Anna did not think that nature had any effect on her. Only Karl and Anders think about sustainably in their daily lives, Karl mostly thinks about global warming since it is a threat to his alpine skiing. Except for Anders that tries to act sustainably to some extent, none of them act sustainably. They can all consider making small changes in their lifestyle in the future if it was necessary in order to protect nature. The information from the interviews and reflective texts seems to be in line with the scores on the pre-NR-21 for all participants except for Anders that shows a higher degree of nature connectedness in his reflective text.

Post intervention, all three of the CG participants claimed that their nature connectedness, their sustainability views and actions, remained the same. Among the IG participants, Emma described an unchanged nature connectedness although showed signs of an increased nature connectedness in valuing nature higher, showing greater awareness in sustainability issues and being more open to act sustainably in the future. Erika described an increased nature connectedness and was also more motivated to act sustainably in the future. Alfred expressed an unchanged nature connectedness but also showed signs of increased nature connectedness in valuing nature higher.

**Summary of the IG Participants with the Highest Nature Connectedness on the Pre-NR-21**

The three participants in the IG with the highest nature connectedness on the pre-NR-21 scale were aged 16 and were all females and active cross-country skiing competitors: Freja (4.43), Vera (4.40), and Sara (4.00). In the pre-material, both the interviewed participants, Freja and Vera, had parents that spent a great deal of time with them in nature and instilled values of appreciating and caring for nature in them. Both Freja and Sara saw themselves as a part of nature, but Vera was unsure. However, all three valued the rest of nature, as in plants and animals, highly. All three thought about sustainability and made sustainable choices in their daily lives; and could consider making major lifestyle changes in the future in order to contribute to sustainability. The pre interviews and reflective texts seemed to corroborate the results from the pre-NR-21, showing a high degree of nature connectedness.

In the post-interviews and reflective texts, Freja and Sara expressed an unchanged nature connectedness, Vera however expressed a stronger nature connectedness and also stated that she is a part of nature (compared to pre intervention when she was not sure). All three described feeling more motivated and strengthened in continuing to act sustainably. Freja did not increase her sustainability actions since she was already acting very sustainably; however Vera and Sara had increased their sustainability actions.

**Summary of the CG Participants with the Highest Nature Connectedness on the Pre-NR-21**

The three participants in the CG with the highest nature connectedness on the pre-NR-21 scale were all aged 17 and female, Madeleine (4.48), Klara (4.05) and Hanna (4.00). Madeleine and Hanna are active cross country skiing competitors. Madeleine had parents that spend a great deal of time with her in nature, Klara had preschool and schoolteachers that did. Madeleine’s mother instilled values of appreciating and caring for nature in her; perhaps something similar was experienced by Klara from her teachers. While Madeleine and Hanna were sure about seeing themselves as a part of nature, Klara was unsure, leaning towards not being a part of nature. All three however valued the rest of nature, as
in plants and animals, highly. They all thought about sustainability and made sustainable choices in their daily lives; and could consider making lifestyle changes in the future in order to contribute to sustainability. Klara was clear that she would do anything for nature. The interviews and reflective texts seemed to corroborate the results from the pre-NR-21.

At the post occasion, all three CG participants claimed that their nature connectedness, their sustainability views and actions, remained the same as at the pre occasion.

**Summary of the IG Participants with Average Nature Connectedness on the Pre-NR-21**

The three IG participants with the average pre-NR-21 scores; in between neutral and rather high; were male, aged 16. Two were cross-country skiing competitors, Erik (3.48) and William (3.71); and one was an alpine skiing competitor, David (3.48). All three did quite a lot of training outdoors but did not regularly spend time in nature outside of that. Erik and David did not seem to spend as much time in nature with their parents when growing up as the two interviewed IG participants with the highest pre-NR-21, although they did seem to do some activities with their parents in nature. For Erik, this seemed mostly utility based, hunting or picking mushrooms or berries; while David picked berries and mushrooms in the fall. Erik considers himself medium connected to nature while David thinks he is pretty close to nature since he spends a lot of time in it during alpine skiing training. Erik was unsure whether he was a part of nature, but David and William were sure they were not a part of nature. While Erik thought that human development was important although it was preferable if it was sustainable, David and William thought the interests of animals and humans should be considered equal. Erik and William were aware of, thinking about, and to some extent trying to act sustainably; David did not think about or act sustainably. All three however could consider making some future lifestyle changes to increase sustainability. So, while David expressed a slightly higher theoretical value of nature, as in animals and plants; Erik was doing more in practice by thinking about and acting sustainably in everyday life. William valued nature both in theory and in practice to some extent. The pre interviews and reflections seemed to corroborate the results from the pre-NR-21, showing a slightly higher than medium degree of nature connectedness (Erik and David scored 3.48 on the pre-NR-21 where 3 is neutral, and William 3.71).

In the post-interview, both Erik and David expressed feeling slightly closer to nature; William felt the same but all three expressed feeling more motivated to act sustainably and also acting a little more sustainably.

**Summary of the CG Participants with Average Nature Connectedness on the Pre-NR-21**

The three CG participants with pre-NR-21 average scores were females aged 17, Elsa (3.48), Evelina (3.48) a cross country skiing competitor, and Tilde (3.43). All three spent rather much time outdoors, Elsa on regular walks and sometimes with her family; Evelina when training a few times per week; and Tilde mostly on forest walks. Evelina did not mention spending any time in nature with her family while Elsa and Tilde spent quite a lot of time in nature with her family, mostly at their cabins, fishing and riding snowmobiles, more for utility purposes and socialising. Elsa considered herself connected to nature since she spends a lot of time in it, and so did Tilde; while for Evelina it varied, she felt a little connected when not in nature, but more connected when in nature. Elsa saw herself as a part of nature, Evelina was unsure about whether she was or was not, and Tilde was sure she was not a part of nature. Elsa thought about and acted sustainably on some issues, while Evelina and Tilde did not do so in everyday life, but she did think that it was important to protect animals and plants. All three could consider making slight lifestyle changes to increase sustainability.
The interviews and reflective texts seemed to corroborate the results from the pre-NR-21, showing a slightly higher than high degree of nature connectedness (Elsa and Evelina scored 3.48 on the pre-NR-21, and Tilde 3.43, where 3 is neutral).

In the post interviews and reflections, all three CG participants said that their nature connectedness, their sustainability views and actions, were the same as in the pre-interview although Evelina explained that even though she felt like her nature connectedness was the same, her view of it had changed since participating in the study had made her aware of that it was lower now than previously, since she spent less time in it now when not living in a place surrounded by it.

**Summary of the IG Participants with the Lowest Nature Connectedness on the Pre-NR-21**

The three IG participants with the lowest nature connectedness Pre-NR-21 scores were all aged 16; two were females: Emma (2.67) and Erika (2.67); and one was male: Alfred (2.86). None of them did any training outdoors and all three spent significantly less time in nature compared to the participants with median and high NR-21. It also seems that Emma and Erika (that were interviewed) spent less time in nature with their parents when growing up, although Erika sometimes went on snowmobile excursions. Although both Emma and Erika felt medium connected to nature, both were confident that they were separate from nature. Alfred neither felt connected to nature nor saw himself as a part of nature. All three stated that they had not really thought about sustainability and do not make sustainable choices, but Emma and Erika said that they could consider making some future lifestyle changes to increase sustainability, to protect nature. The interviews and reflective texts seemed to corroborate the results from the pre-NR-21, showing a low degree of nature connectedness.

In the post-interviews, Emma and Alfred described feeling the same nature connectedness but valuing nature higher. Erika described a slight increase in her nature connectedness and also valued nature higher. All three reported being more aware of sustainability issues and more motivated to act sustainably.

**Summary of the CG Participants with the Lowest Nature Connectedness on the Pre-NR-21**

The two CG participants with the lowest nature connectedness on the pre-NR-21 were two boys, Karl (2.24) and Anders (2.81), and one girl, Anna (2.67); all aged 17. Anna hardly spent any time in nature except during school time while Karl and Anders spent a lot of time in nature while training (however for Karl mostly in slopes during the wintertime, which do not have as much unbuilt nature thereby offering less opportunities to activate the five biophilic values), Karl did not spend time in nature outside of training, but Anders did. Neither Karl nor Anna (that were interviewed) seemed to have spent much time in nature with their parents when growing up. Neither Karl nor Anna really expressed any feeling of being connected to nature, Anna saw herself as a five on a ten-degree scale but did not think that nature was meaningful or important to her. Anders however felt connected to nature and saw himself as a part of nature. Karl saw nature as important mainly from the perspective that he was an alpine skier and needed the snow, although also expressing that it was important to protect endangered species. Anna thought that both the interests of nature and humans were important. Anders thought that the interests of humans should be prioritised. Neither Karl nor Anna did anything actively to contribute to sustainability, although Karl said that he thought about global warming, again since he was worried about snow for skiing. Anders however thought about sustainability and tried to act sustainably. All three could consider making small changes in their lifestyle to protect animals and plants.

The interviews and reflective texts seemed to corroborate the results from the NR-21 for Karl and Anna, showing a low degree of nature connectedness. Anders score was almost at neutral (2.81), he spent quite a lot of time in nature, saw himself as a part of nature and was aware of sustainability.
issues, indicating a higher degree of nature connectedness than his score. However, he did think that human interests should be prioritised over nature, congruent with a lower nature connectedness.

In the post interview and reflective text, all three CG participants explained that their nature connectedness, their sustainability views and actions, were unchanged from the pre occasion.

**IG Participant with the Highest Pre-NR-21 (4.43), Freja, Participant Number 30**

The IG participant with the highest pre-NR-21 score (4.43), Freja, a female, cross-country skiing competitor, aged 16 explained her sense of being so close to nature and why nature was so important to her, with having Sami (Nordic indigenous people) parents and grandparents, who spent a lot of time with her in nature, in the mountains and forests. She explained that when she was growing up, she spent almost all her time out in nature with her parents and grandparents, except for when being at school.

Freja was also the only one that said that she still spent as much time as possible outdoors in nature, just as much time as when growing up; the only difference being that nowadays she was doing more training and less spontaneous excursions in nature, this difference was congruent with the other interviewed participants with high NR-21 scores. She also still takes regular walks in nature to relax. School leaves are typically in the mountains with her family. Her favourite place in nature is a place halfway to a mountain that her family (parents and grandparents) often visits; a place where they always stop to barbecue on their way to the mountain. Freja’s favourite smell in nature was mountain fen, which she really appreciated since it reminded her of all the cosy times spent in the mountains.

Freja described herself as feeling connected to nature and the reasons behind that: “I’d say I’m close, because that’s where I escape to when I need a break so to say, and it’s also where I grew up”. In her reflective text, she explains her close relationship with nature with her Sami background and spending a lot of time in nature:

I would say that I have a rather close relation with nature since I belong to a Sami family and have spent a great deal of time in mountains and forests all my life. I also train a lot in the forest, I often get out several times a week on either walks or runs or excursions in the forest since it gives a sense of calm and I that live in a small town feel that it’s in the forest that you get away from all the noise and all these heaps of people. The forest is kind of like my own break from reality where you can focus solely on yourself. It doesn’t really matter what you do there, you can pick berries, mushrooms or go skiing, running or something else that you enjoy.

She also saw herself as a part of nature; when asked if she saw herself as a part of nature or as separate from it, she answered: “A part of nature, we’re all basically a part of nature”. To Freja spending time in nature was associated mainly with two things; having a nice, cosy time socialising with family; and a chance to relax, calm down, think, take a break and be oneself: “As I said before, a chance to relax and be yourself, there’s never any pressure on you out in the woods … yes a sense of calmness, I get a feeling of having had a break and some thinking”.

When it comes to valuing and caring for nature, Freja expressed that it was important to care for nature: “I think it should be our number one priority to protect nature, which it obviously isn’t. Because we also come from animals, it wouldn’t have been that much fun if they were trying to like exterminate us”. In her reflective text she explained human interconnectedness with nature further:

According to me we’re all a part of nature since our ancestors have lived solely upon nature’s assets and technically we still do. Without nature we wouldn’t get food or water or oxygen so that we can live, therefore preserving our forests and nature is very important so that we can continue to live with a high quality of life. The animals are really important too since they are the ones that sustain the natural balance, for example small animals that eat grass and flowers help bring pollen that got caught in their fur from flower to flower so that they can grow and more animals can get food, the larger animals eat the small ones do that they don’t become too many and even the small insects are important since they clean up in our nature.
Freja also said that she always had sustainability in mind; she does not buy a lot of stuff and instead uses what she has; she also recycles packages and food waste; arguing that this is what she can do right now. When asked if she could consider changing her lifestyle in order to protect nature, as in animals and plants, she was very open to this: “I’m pretty open to change if it means helping nature, there’s not a lot that I couldn’t change, if you say so”. Freja also suggests that if she wanted to be more radical she could eat even less meat and stop going in a car, although at the moment she already travels very little by car. She also thinks that she and others should follow Greta Thunberg’s example and help bring people’s attention to “how things really are”. Freja also mentions that she could choose a profession that does not involve having to drive long distances in a car every day, but one that is more in line with awareness of for example pollution.

To summarise the most important information on the degree of nature connectedness, Freja, feels very close to nature (high NR-Self, pre-score was 4.44; INS 5), spends a great deal of time in nature (high NR-Experience, pre-score was 4.17), values the rest of nature (plants and animals) highly and thinks about and acts sustainably as well as is able to consider making great changes in her lifestyle to increase sustainability (high NR-Perspective, pre-score was 4.67), PEAB score was 3.86. Hence, the information received from the interview was congruent with Freja’s pre-NR-21.

In the post interview and reflection, Freja described her nature connectedness as unchanged, that it was as strong as before the intervention and her strong relationship to nature is due to her Sami background which led to spending a lot of time in nature. However, she did learn more about sustainability issues and how nature’s affected, confirming to her that it is important that she continues to act sustainably, and increasing her motivation to do so. Since she was already acting very sustainably, she had not done any changes to this. This matched well with her post-NR-21 score that only increased slightly from 4.43 to 4.57 (post-NR-Self 4.56, post-NR-Perspective 5, post-NR-Experience 4.17) and post PEAB that increased from 3.86 to 4.05.

**IG Participant with the Second Highest IG Pre-NR-21 (4.40), Vera, Participant Number 26**

The IG participant with the second highest IG pre-NR-21 score (4.40); Vera, female, cross-country skier, aged 16; was raised on a farm in the woods in a small village with a few kilometres to the nearest store. When growing up she spent a lot of time outdoors; playing and building tree houses with her younger brother after school, helping her parents on the farm with carpentry and other things, and going to cross country and orienteering training. Her family also went fishing, skiing, and hiking and trekking while staying in cottages in the mountains together with another family. She also remembers camping in the mountains with her mother. Vera thinks these activities outdoors with family and friends were important in shaping her current relationship with nature. Currently she spends time in nature every day when training and going for evening walks, during the summers she also likes to play volleyball and go swimming with the others in the cross-country training group and during the winter they do a lot of skiing. Still, Vera thinks she spends less time in nature now when living in a more built environment and going to school, she also thinks it is more planned activities and not as spontaneous as when growing up and just being outside playing. During leaves from school, she and her family still goes trekking and skiing in the mountains. Vera’s favourite place in nature is a cabin in a mountain area that her family’s visited ever since she was a young child, she basically spent all of her summers there when growing up. Her favourite smell in nature is mountain heather that brings back memories of spending time in the mountains and trekking in the mountains.

The felt degree of nature connectedness is high for Vera, she also refers to her growing up in nature, just as Freja, as an explanation for that; “I feel like it’s a big part of my childhood, so it feels like I have a pretty good relation to nature, that I’m in nature a lot”. Vera, on the contrary from Freja,
is a bit unsure about whether she is a part of nature; “I’m not sure, I don’t feel like the same thing as nature but that one blends in and is allowed to be there when one is there”. Just as Freja, Vera describes nature as being associated with community with family and friends, joy, and having fun; but also with safety, which could be similar to Freja’s description of a place where you can feel calm and be yourself. For Vera, nature is also a place for relaxation, if she is stressed, she goes for a walk in nature to feel calm. For her, nature is also very associated with cross country skiing and the love for cross country skiing.

When it comes to nature’s (animals and plants) value compared to humans, Vera is a bit more unsure than Freja; Vera thinks nature should be treated with respect but she is unsure if animals have the same value as humans. However, she expresses that: “I think we should try to protect nature as much as we can and not try to work against nature and destroy it.”. Vera considers sustainability in her daily life and tries to make sustainable choices when shopping, buying organic or locally grown when possible; and recycles; but she thinks it is more difficult to keep track of everything after moving away from home and staying on her own. Vera’s very open to lifestyle changes to increase sustainability and protect nature, just as Freja. As Vera puts it; “I could change a lot, I don’t mind living in a cabin in the woods, I could change a lot really”. To do more to contribute to a more sustainable society in the future, Vera mentions both mentions she could vote in elections with sustainability in mind and find a profession that contributes to a better future for the environment instead of the opposite.

To summarise the most important information on the degree of nature connectedness, Vera feels very close to nature (high NR-Self, pre-score was 4; INS 5), spends a great deal of time in nature (high NR-Experience, pre-score was 4.33), values the rest of nature (plants and animals) rather high but not as high as humans, and thinks about and acts sustainably as well as is able to consider making major changes in her lifestyle to increase sustainability (high NR-Perspective, pre-score was 4.17; PEAB score was 4.05). Hence, the information received from the interview was congruent with Vera’s score on the pre-NR-21.

In the post interview and reflection, Vera described an increased nature connectedness, feeling closer to nature and that she had become more aware of how important it is to her as well as that we’re all dependent on nature and a part of it. Now she is sure about that she is a part of nature. She had also started growing some plants and being more attentive to the nature around her when training or walking in it. Since she was already acting and living very sustainably, she had only increased her sustainability actions slightly; she expressed that she had learnt a lot more about sustainability issues and how nature’s affected and that this had really given her a confirmation that it was right to continue to act sustainably, really strengthening her motivation to do so. This matched well with her post-NR-21 score that increased from 4.40 to 4.62 (post-NR-Self 4.56, post-NR-Perspective 4.5, post-NR-Experience 4.83); her post-PEAB however showed an even greater increase, from 2.05 to 4.5.

**IG Participant with the Third Highest IG Pre-NR-21, 4.00, Sara (IG 19) (Post 4.38)**

Sara, the IG participant with the third highest IG pre-NR-21 score, a female cross country skiing competitor, was not interviewed before but her pre-reflection showed a sense of nature connectedness and sustainability views and actions that corresponded well with the other IG participants with higher scores on pre-NR-21; Freja and Vera. In her post-reflection, Sara described that her nature connectedness was similar to before but that she had become more aware of it; however she did think that her sustainability attitude and actions had increased.

Sara writes in her pre-reflection about having a rather strong connection with nature since she spends a lot of time in nature when doing activities and training; “Nature means sort of quite a bit for me considering that what I do in my free time is being a lot in nature, such as for example trekking in
the mountains, orienteering, cross country skiing. Because of this, kinda, I feel a rather strong sense of affinity with nature.”. Doing activities in nature is something that she does every day in general, other than the previously mentioned activities, she also does running, walking and roller skiing; when she goes trekking in the mountains it is both on and off trails. Sara describes it as that she does a lot of different activities in nature and that she does activities in nature very often.

Sara also sees herself as a part of nature, arguing that she does so because humans are part of the natural cycle and that humans are affected by what happens in nature; “I see myself as a small part of nature considering that we humans belong to the natural cycle. But also, since a lot that happens in nature affects me and also others.”. Further, she argues that nature and animals should be protected and prioritised above human interests; “I think we should protect nature and the animals that live in nature. In my opinion nature should be protected and nature and animals should be prioritised higher than human interests.”

As for sustainability, Sara thinks about and acts sustainably in her everyday life; she thinks about what type of food she buys; trying to buy locally or organically produced; recycles, uses her bicycle for transportation most of the time and takes the bus or carpools with someone when travelling back home to visit her parents. To increase sustainability in society in the future, Sara is willing to continue with what she is already doing as well as be mindful of where the stuff she buys comes from and try to buy second hand. She thinks if she would live a sustainable life, she could inspire others in society to do the same. She would also like to work within a profession that is environmentally aware and has an environmentally friendly workplace, it should also be possible for her to walk or ride her bicycle to work. She would also like to educate her co-workers and other athletes in her ski association on how to be more environmentally friendly.

In her post-reflection, Sara described that she still felt a strong connectedness to nature and did not think that it had actually changed, it was just that she was more aware of it and reminded about how important nature is to her. She did however describe that she valued nature’s interest higher and that she had started to think more about sustainability issues, that she now thought that it was more important to protect nature and to act sustainably, and that she had also started acting more sustainably. Sara also described being more inclined to act as a citizen to influence society to become more sustainable, as well as influencing sustainability at her future workplace. This matched well with her increased NR-21, from 4.00 to 4.38, however her PEAB remained unchanged at 4.45.

**CG Participant with the Highest Pre-NR-21 (4.48), Madeleine, Participant Number 21**

The CG participant with the highest CG pre-NR-21 score, 4.48, was Madeleine, a female 17-year-old cross country skiing competitor. Madeleine grew up in a small suburb with a forest right behind her house but at the same time having close neighbours. When growing up she spent a lot of time in nature, just being outside or playing games or training; running and skiing and moving about. She especially remembers spending a lot of time with her mom and sister in nature, but also with her friends, and at the preschool where they were outside a lot, and the primary school at which they had sports in the forest almost all the time. Madeleine thinks that her mom had a great influence on the relationship to nature that she has today; “Mom has probably influenced my relationship to nature today, that we were outside a lot and copied what she did, if she followed the right of public access rules then one did so too, she behaved in a way that showed that one should value and take care of nature.” Her family spent most of their holidays trekking in the mountains or by the ocean where they mostly sailed. Nowadays Madeleine mostly does training, five to six days a week, and goes for daily walks or picks berries (when they are in season) in nature, mostly forested areas. During holidays she still goes trekking in the mountains or sailing on the ocean near the coast. Because of training in nature
almost every day, Madeleine thinks she spends the same amount or more time in nature now than when growing up, but now it is more focused on training than play. Madeleine’s kind of pleased with the amount of time she spends in nature, but she would prefer to have more time in nature that is more relaxed, being there just because it is nice picking berries. Her favourite place in nature is the woods at home where she spent a lot of time as a child, it brings back lots of memories at the same time as it is relaxing to be there for her. When asked about a memorable experience in nature, Madeleine thinks quickly and tells a story of when she was a little girl and was not allowed to climb a tree because the ground was frozen and hard, she had told her parents that she did not climb the tree but apparently she left a little bucket up there so it was clear that she had climbed the tree; her parents often remind her about this event, it is still something they laugh about. She has also got many fond memories of being out on the ocean “Just like being out on the ocean is something I really like a lot too. It’s like, yes but … [thinking a little], it’s like kind of cool because it’s water and water is both wonderful and like a little scary at the same time and it’s like nice summer days that you spent there”. When asked about her favourite smell in nature, Madeleine goes back to the ocean and mentions saltwater and brackish water, and also sweat because she is often moving in nature and that is a good thing.

When asked about how connected she feels to nature, Madeleine replies that it is important to her, and now when she is focused on competing in cross country skiing, it is especially important to treat it well so there will be snow. Madeleine sees herself as a part of nature “I see myself, and all people, as a part of the natural cycle and thereby as a part of nature since I personally have a great effect on nature.”. Nature is rather significant to her, especially as a place to get away from the stress in everyday life and relax. Madeleine thinks that in nature it is easier for her to relax and let go of things, it is a peaceful place.

As for the value of nature, Madeleine thinks that it is very important to care for nature but at the same time she as a human being will somehow prioritise human interest. However, she states that: “Nature’s value I see as very important since we humans wouldn’t have been able to live without nature and therefore we humans must, to be able to prioritise our own interests in the long run, also prioritise nature's interests and protect animals and nature.”

She acknowledges that humans affect nature and therefore need to be mindful of what we do and that in the end we would not survive without animals and plants, and that animals and plants also have their own intrinsic value.

About living sustainably, Madeleine’s assertive that this is very important to her, something that she thinks about a lot and tries to act for; “It’s something I think about often, like every time I cook basically, what I cook; mostly vegetarian; how I cook, and how to sort the waste and so. Like travels too, I don’t have my own car, but I often carpool with others or travel by public transport. Sustainability is an important part of everyday life, really.”. When asked about if she could consider making further lifestyle changes to increase sustainability and protect nature; Madeleine replies she would do this if it was backed up by facts; “Yes if you get concrete facts on how and why you need to change, instead of erratic information. It would be great if you got concrete examples on what would happen if you didn’t make the changes”. In the future, to contribute to a more sustainable society, she mentions she could stop buying things just because she is tempted to and try to buy more thought through high quality or preferably used stuff. Madeleine argues that she would do this because she does not want to support the current consumption society where people are pressured to buy more and more things; “This to not support the consumption society of today where there’s constant pressure on us consumers to buy more and more through sales and offers etc.”. Another thing she would like to get better at is buying what is in season in Sweden to reduce transportations from other countries. Recycling is another area she thinks she could do even better at, arguing that this would be a lot easier
if recycling stations were more easily accessible. As a citizen, she would definitely vote for a political party that prioritises the environment and sustainability. Further, Madeleine considers it her duty to help others, such as elderly people and children, to become more sustainable; by teaching them what she knows and helping them out if necessary. This she would also do in her work life, she thinks she could help spread awareness on sustainability and make sure that her workplace is as sustainable as possible, for example recycles, carpool or could subsidise public transport.

To summarise the most important information on the degree of nature connectedness, Madeleine, feels very close to nature, like part of the natural cycle (high NR-Self, pre-score was 4.56; INS 7), spends a great deal of time in nature (high NR-Experience, pre-score was 4.3), values the rest of nature (plants and animals) highly, for their own intrinsic value, and thinks a lot about and acts sustainably as well as is able to consider making fact based changes in her lifestyle to increase sustainability (high NR-Perspective, pre-score was 4.5, PEAB 4.56). Hence, the information received from the interview was congruent with Madeleine’s score on the pre-NR-21.

In the post interview and reflection, Madeleine was clear that her nature connectedness, her sustainability views as well as sustainibility actions, all remained the same as at the pre occasion. This matched well will with her post-NR-21 that was almost the same as her pre-score, just marginally increased by 0.09, from 4.48 to 4.52 (post-NR-Self 4.78, post-NR-Perspective 4.85, post-NR-Experience 4.00) and unchanged PEAB at 4.56.

CG Participant with the Highest Pre-NR-21 (4.05), Klara, Participant Number Six

The CG participant with the second highest pre-NR-21 score, 4.05, was Klara, a female 17-year-old. Klara grew up in the countryside with the forest surrounding her house. During her childhood she spent a lot of time in the forest, both with her friend, playing around, having fun and building treehouses pretty much every day; and with her preschool and school. In preschool Klara spent a lot of time in the surrounding small patch of forest and in preschool and all the way up to 4th grade she spent two full days per week in the forest. There they used to do all kinds of activities such as searching for the longest stick, look at animal faeces, investigate the age of rocks, barbeque and play family on the rocks out there. Outside of this there was also another small patch of forest right by the school that Klara and her friends used to play in and build treehouses in during breaktime. She does not remember spending much time in nature with her parent, her mother, except for the occasional barbeque together with other families. Nowadays Klara does not really spend any time in nature except that her house lies in the forest, but she does not go into the forest anymore, unless if it is to go visit someone whose cottage is in the forest. When asked if she is content with not spending time in nature, Klara says that she would like to but her friends are not interested: “I loved being in nature as a child, but it just hasn’t happened lately, I think I’ve kind of grown out of it, I’d actually like to spend more time in nature but, it’s more like you hang out with friends and there’s no one that’s interested in being there; so maybe it will happen in the future.”. Special places in nature to Klara are the school forest that they used to visit and a specific climbing tree that she used to visit with her preschool and school. She cannot really think of a specific memory in nature, she just has lots of general memories from spending time in the forest during her childhood. Her favourite scent in nature is the hackberry tree flowers.

Klara describes her relationship with and sense of closeness to nature as “in between”, at first, she is not sure whether she is a part of nature or separate from it but then says she might feel that she is not a part of it. When asked about the importance of nature, Klara is very clear that it is very important to her, that nature is necessary for our survival and that the forest means a lot to her since she spent so much time in it during her childhood; “Yes without nature we wouldn’t survive so it
means a lot, and I would not want to be without the forest. It was so important to me when I was a child, you were happy there, there’s so many childhood memories in the forest, maybe that’s why you don’t want it to disappear, because you have so many memories from there.”.

As for the value of plants and animals compared to humans, Klara is very determined that nature should be put first; “I think you should protect nature more than our own interests”. Spending time in nature makes Klara feel happy and calm.

Regarding sustainability, this is very important to Klara, and she tries to live sustainably; “I always try to recycle, and I never throw stuff in nature but instead I often pick up trash, unless it is too disgusting. And then I return bottles and I try to think as sustainably as possible when I do things.”. When asked if she could consider changing her lifestyle in order to protect animals and plants, Klara is very determined she would; “I would do that, I wouldn’t have hesitated, I’d done what I could do. I’d let go of what I had around me, except for my family of course, and I’d contribute and help as much as I can. You don’t want the memories you had as a child to disappear and you want your own children to have the chance to experience the same thing, so that it’s not that when you come back in fifty years that place that you loved the most is gone.”.

To summarise the most important information on the degree of nature connectedness, Klara, nowadays feels medium connected to nature although it is still very important to her (difficult to interpret but medium-rather high NR-Self, pre-score was 4.0; INS 5) she does not spend any time in nature anymore but lives in a forest so still is in some contact with nature every day (medium NR-Experience, pre-score was 3.5), values the rest of nature (plants and animals) highly; and thinks quite a lot about and acts sustainably, as well as is able to consider making any changes necessary in her lifestyle to protect animals and plants (high pre-NR-Perspective, score was 4.67; PEAB 5). Hence, the information received from the interview was mostly congruent with Klara’s score on the NR-21 but giving a more in-depth and complex view. Her pre-NR-Self was a 4, which is rather high (in between neutral and high), this could be interpreted as being congruent with her seeing nature as extremely important although, with some doubt, thinking of herself as something separate from nature.

In the post interview and reflection, Klara said that her nature connectedness, her sustainability views as well as sustainability actions, had not changed since the pre occasion. This matched well will with her post-NR-21 that was almost the same as her pre-score, just marginally decreased, from 4.05 to 3.86 (post-NR-Self 3.89, post-NR-Perspective 4.84, post-NR-Experience 2.83; post-INS 5) although her PEAB had decreased from 5.00 to 4.32 that is lower but still very high.

**CG Participant with the Third Highest CG Pre-NR-21, 4.00, Hanna (CG 20), Post 3.29**

Hanna, the CG participant with the third highest CG pre-NR-21 score, a female cross-country skiing competitor, was not among the participants that were interviewed. However, she wrote a pre-reflection on her nature connectedness and sustainability views and actions that was very compatible with the other high pre-NR-21 participants that compete in cross-country skiing (which is all high pre-NR-21 participants except for Klara). Hanna spends quite a lot of time training in nature; describes nature as important to her, kind of like a sanctuary where she can clear her mind; she feels connected to nature, especially when she is in it; and she thinks about and acts sustainably in her everyday life. All compatible with the other high pre-NR-21 cross-country skiing competitors. Just like the other CG participants, Hanna stated in her post-reflection as well as in the post-interview, that nothing had changed, which was compatible with her almost unchanged post-NR-21 score.

In her pre-reflection Hanna described her relationship with nature as an easy and uncomplicated one, she spends several times a week in nature training, for example running, cross-country skiing, bicycling. She describes nature as quite important to her, a sanctuary where she can
breathe fresh air and clear her mind, affecting her in a positive way: “Nature means quite a lot to me since it’s kind of like a sanctuary to me. To get out and breathe fresh air and clear your mind. I’m almost always positively affected by being in nature, except for it the weather is extremely bad.” Hanna also sees herself as a part of nature when she is in it: “I see myself as a part of nature when I’m in it”. As for nature’s value, Hanna is clear that without nature, nothing would work and therefore it should be protected: “I see nature’s value as huge since nothing would work as it does today without it. I also think that animals and nature should be protected to the highest degree for the same reason.”.

Concerning sustainability, Hanna thinks about and acts sustainably in her everyday life. She buys organic and locally produced food, repairs and reuses, recycles and uses her bicycle for transportation when possible and otherwise public transportation, instead of using a car. In the future, to increase sustainability in society, she would be willing to continue with what she is already doing and try to encourage others to do the same.

In her post-reflection, Hanna stated that she felt and acted the same way as in her pre-reflection, however her post-NR-21 score was 0.71 lower than her pre-NR-21 score and her PEAB dropped from 3.88 to 3.27. The drop in her post scores might have been due to something particular on one of the days of filling out the NR-21 questionnaire, or that she misread some questions, since both her reflections and her drawings with comments showed quite a good connection with nature and showed many similarities with the other high pre-NR-21 participants. Hence, it seems Hanna’s post-NR-21 and PEAB were less likely to be significative to show her degree of or any changes in nature connectedness or PEAB.

IG Participant with Average Pre-NR-21 score (3.48), Erik, Participant Number 21

Erik, a 16-year-old male student competing in cross-country skiing, was one of the IG average score participants at 3.48 on the pre-NR-21. Erik grew up on the coastal countryside, he does not really remember how much time he spent in nature when growing up and thinks that it varied but that he probably spent at least some time outdoors most days. When asked who inspired his interest to be in nature, he thinks his parents had a great influence but also his first to third grade teacher with whom he and his class spent a lot of time in nature with, and he also went bird watching with her outside of school time. Currently, Erik spends most of his time in nature (forested areas) when training; usually around five days a week, for about two hours per time. During fall time he is usually outdoors even more, around six days per week (usually in forest or coastal areas) since he then also goes hunting (for moose, forest birds and waterfowl), picking berries and mushrooms and “all kinds of things”. He says he enjoys being out in nature even if he does not catch anything. He also enjoys spending time just being in nature once or twice a week. When Erik compares the amount of time he spends outdoors now with when growing up, he says he might be spending a little less time outdoors now; but the main change is moving from more playful activities to training, hunting and picking berries and mushrooms. He is more or less content with the amount of time he spends in nature now but would not mind if it was more. As for a favourite spot in nature, he mentions a part of the forest where the black grouse used to play, Erik used to go there with his father but now it is a clear-cut, so the black grouse do not come there anymore and neither do Erik and his dad. They still go to a cottage nearby, without electricity or water, which is still a favourite spot of Erik’s. Erik’s most memorable experiences in nature are connected to hunting, he especially remembers when they shot the first moose for their new puppy, which he thought was a big moment. When asked about a favourite scent in nature, Erik picks the smell of the ocean since this is where he grew up and the smell brings back memories.

Erik does not know how to describe his relationship with nature or degree of connectedness to nature, he thinks it is a tricky question but eventually decides that he would consider himself medium
connected to nature. In the interview, he neither knows whether to consider himself a part of nature or not, or if nature has any particular meaning to him; “Yes, well it’s clear that nature is important, you can’t deny that, but … specifically, no this is difficult. It’s hard to put words to it”. In his reflective text, he describes that he does not see himself as a particularly included part of nature in everyday life in society; but he does see himself as a partly integrated piece of nature. As for the experienced effects of being in nature, he says it varies, for example if he is training or doing something else; when he is out hunting, he thinks it is relaxing to listen to the sounds in nature and to look for animal tracks.

As for the value of nature as in plants and animals in relation to humans; Erik talks about development as important but that it can hopefully be done in a way that works with nature. He argues that you need a society that strives towards developing, but at the same time, the two need to be weighed against each other, that it is not a black or white type of issue; “Hopefully money can be invested in projects that are good for the environment as well, and people with money can choose to buy products that are more expensive but better for the climate”. He gives an example, he thinks that it would be wrong to open up a coal mine to give people jobs, even if there is mass unemployment; he thinks there should be other solutions, that nature and the environment should be prioritised.

Concerning sustainability, Erik think’s life is pretty busy at his age but he does look at the type of food he buys and tries to buy sustainably when his economy allows for it. He also does not buy a lot of stuff, partly because he does not have that much money, and partly because he thinks he can get by with what he has. As regards to making lifestyle changes for sustainability and to protect nature, Erik is rather open to this. “Hmm, yes well it’s difficult to answer, but actually, to a rather high degree I would say. It would be depressing if more animals died out, as we’ve learnt about now from schoolwork [referring to an earlier learning module on sustainability in the social sciences class with me] so to a rather large extent, but not anything, if it’s too much or too difficult you might lose your motivation in the long run and not continue with the changes”. In the future he thinks he could try increase his degree of sustainability actions and try to affect the ski association he is in to do more carpooling, sustainable food choices and to only use fluoro-free ski wax.

To summarise the most important information on the degree of nature connectedness, Erik says nature is important and says he feels medium connected to nature (medium pre-NR-Self 3.44; INS 4), he spends rather much time in nature but mainly during training (which could make nature more of a backdrop), except for during the fall (medium NR-Experience, pre-score was 3.33), values the rest of nature (plants and animals) but not as high as humans, and somewhat thinks about and acts sustainably as well as is able to consider making quite a few changes in his lifestyle to increase sustainability (medium NR-Perspective, pre-score was 3.67; and PEAB 3.15). Hence, the information received from the interview can be interpreted as being in line with Erik’s score on the pre-NR-21.

In the post interview and reflection, Erik explained that he felt slightly closer to nature and he now sees himself as a part of nature. He also said that his motivation to act sustainably had increased, which made him try a little harder to live sustainably (for example buying more local and organic food). Congruent with his post-NR-21 score that increased from 3.48 3.67 (post-NR-Self 3.44, post-NR-Perspective 3.67, post-NR-Experience 4) and PEAB that increased from 3.15 to 3.75.

**IG Participant with Average Pre-NR-21 score (3.48), David, Participant Number 25**

David, a 16-year-old male student competing in alpine skiing, was the other IG participant with an average score on the pre-NR-21, 3.48. David grew up in a suburb with a forest nature reserve about a hundred metres from his family’s house. When he was a child he spent a lot of time in nature, he used to play a lot with friends in the forest, did a lot of alpine skiing training and sometimes picked berries and mushrooms with his parents. Currently he mostly does training in nature, running in the
summer and alpine skiing in the winter; he also sometimes picks berries and mushrooms with his parents in the fall, rides the family boat on their lake, bicycling or just going for a walk in the forest. David thinks he spends about the same amount of time in nature now as during his childhood and is content with this. His favourite place in nature is the mountains where he goes skiing. At first, he cannot think of a memorable experience in nature, but as we return to the question he thinks for a while and mentions that he really enjoyed the time period when he was in pre-school and his dad was having parental leave for his younger brother, then they used to go alpine skiing in the morning which meant that David arrived later than the others for preschool, he really enjoyed that time in his life. David’s favourite nature smell is fir-tree and the general smell in a forest.

When it comes to the degree of connectedness to nature, David says; “I’d say I’m pretty close, I spend a lot of time in nature skiing”. He does not consider himself a part of nature but thinks that nature is meaningful in the way that he can find peace in it and since without it, he would not be able to do alpine skiing, which is what he loves. Being in nature is a positive thing connected to skiing for David, it makes him feel happy.

Regarding the value of plants and animals compared to humans, he thinks that both are valuable and first says humans might be a little more important but then changes his mind and says they are equally important. In his reflective text, David describes nature as important but that human interests should be somewhat prioritised: “Nature’s anyway the home of animals and plants so I think we humans should adapt a little to that, but human’s interests should also be allowed to be prioritised but maybe in some determined places so that you’re not allowed to do anything everywhere.”

About living sustainability, David does not really think about this. When asked if he could consider changing his lifestyle in order to increase sustainability and protect animals and plants, he says he could try his best. To increase sustainability in society in the future, he could consider buying food that has been produced in a better way and more locally produced foods. He could also try to walk or use public transport instead of using the car.

To summarise the most important information on the degree of nature connectedness, David says he feels pretty close to nature since he spends a lot of time skiing in it but he does not see himself as a part of nature (medium NR-Self, pre-score was 3.22; INS 5), he spends rather much time in nature but mainly during training (which could make nature more of a backdrop) (medium NR-Experience, pre-score was 3.17), values the rest of nature (plants and animals) equal to humans, but does not thinks about or act sustainably; although could try to make some changes if it was necessary (medium to high NR-Perspective, pre-score was 4.17 (theoretical perspective is high, values animals and plants equal to nature; but practice is low, he does not think about or act sustainably) and PEAB 3.05. Hence, the information received from the interview was congruent with David’s score on the pre-NR-21.

In the post interview and reflection, David showed signs of increased nature connectedness as well as concern for and action for sustainability. He talked about that his connectedness to nature is stronger now, he feels very close to it and his appreciation and valuing of nature had increased, describing that nature can help him in difficult situations. He wrote in his reflection that nature is everything to him and makes him happy:

Nature is basically everything for me, it makes me happy in different ways. I’m happy when I get to ski in the mountains, ride a boat on the lake, pick mushrooms and berries in the forest, run and train in nature or just take a regular fantastic walk with the ones I like the best in the forest. As one might understand I like nature incredibly much and it means so much to me.

He now thinks that he is in some ways a part of nature, instead of as previously when he was sure he was not a part of nature. In the post-interview, David puts a greater emphasis on that nature’s very important to him. He explains that nature is important to him because he spends a lot of time in it.
This time, David is sure that the interests of humans and nature should be equally valued, but humans should still be allowed to sometimes kill animals for food. He now thinks about and acts sustainably to some extent (thinking about buying sustainable products and doing recycling). To increase sustainability in the future, he thinks he could contact the managers of the local stores and ask them to buy more locally and organically produced, This matches well with his post-NR-21 score that increased from 3.48 to 3.90 (post-NR-Self: 3.44, post-NR-Perspective: 4.17, post-NR-Experience: 4.33) and PEAB that increased from 3.05 3.73.

IG Participant with Average IG Pre-NR-21 score, 3.48, William (IG 20), Post 3.71

William, one of the IG participants with average IG pre-NR-21 scores, a male cross country skiing competitor, was not among the participants that were interviewed but wrote a pre-reflection on his nature connectedness and sustainability views and actions that was very similar to what the other IG participants with average pre-NR-21 scores described. In his post-reflection, William described his nature connectedness as similar but that he valued nature higher and thought about and acted a little more sustainable.

In his pre-reflection, William described nature as a place for him to relax but mostly acting as his training environment, since he competes in cross-country skiing, he spends a lot of time training in nature during both summer and winter; usually around five days a week. During summertime he does a lot of running in the forests and mountains, and in the wintertime he does a lot of skiing and ice skating. His family sometimes goes out in nature for excursions or a barbeque, but this happened more often when he was younger, now it happens approximately every other month. William thinks that spending time in nature when training makes him feel a rather high connectedness with it, and that seeing different natural environments makes training more fun; “So, through my training I spend a lot of time in nature, which makes me feel a rather high connectedness with it and it makes training more fun since you get to see so many different natural environments.”.

In his pre-reflection, William writes he probably does not see himself as a part of nature, but more as an admirer of it. He thinks that nature definitely should be protected, at the same time humans should continue to utilise it, but in a sustainable way and acknowledges that humans are dependent on nature for survival, which is why nature’s interests should be prioritised; “I definitely think we should try to protect nature as much as we can, not stop utilising it completely but we should do it in a sustainable way. We should prioritise nature and animals first since we are dependent on them for our survival.”.

Concerning sustainability, William thinks a bit about this in his everyday life and tries to act sustainably. He tries to buy locally or organically produced food, and to recycle. Another thing he tries to do is not to cook more food than what he can eat within a few days, so that he does not have to throw food away.

To increase sustainability in the future, William could consider buying more second-hand things and also lending more things, such as tools, from neighbours, instead of buying his own. He could also consider using more public transportation instead of taking the car, and bicycling or walking to work if the distance is not too long. In the ski association he belongs to, he thinks it is important to try to carpool more efficiently when going to competitions so that there is not a lot of half empty cars going instead of fewer full ones.

In his post-reflection, William described his nature connectedness as similar to before except that he valued nature higher, being more aware of how important it is to humans and how bad the state of nature is in some places:
Nature and animals are our biggest priority right now according to me and we must do everything to protect them. We can’t continue to prioritise human interest any longer since we’re entirely dependent on nature to survive. After this teaching segment on humans and nature my view on the value of animals and nature has increased quite a lot since I’ve realised how bad the situation is in some places.

He is still unsure if he is a part of nature, he thinks that even if he breathes out carbon dioxide, he does not really contribute with anything to nature. In his post-reflection, William also described that he thought more about sustainability and acted a little more sustainable, he now tries to eat less meat and cook more vegetarian foods. He was also more motivated to get involved to try influence society to become more sustainable. This was congruent with Williams increased NR-21 from 3.48 to 3.71 and increased PEAB from 3.02 to 4.22.

CG Participant with Average Pre-NR-21 score (3.48), Elsa, Participant Number 1

One of the CG participants with average pre-NR-21 score was Elsa at 3.48, a 17-years old female. Elsa grew up in a village in the countryside with nature just outside the door. When growing up, she spent quite a lot of time in nature, her family had three cottages in the mountains that they visited regularly, and her mom was always outdoors a lot. During the summers the family went fishing a lot and during the wintertime they went snowmobiling a lot with relatives. Nowadays Elsa does not spend as much time in nature as she did a few years ago, she is still spends some time in nature every day on her walks in the woods, but she and her family does not go to their cabins or to visit their grandparents living in the woods as often, when she was younger, they went there basically every other weekend. When compared to during her childhood, she thinks she does the same activities except that then she used to play outdoors and now she goes walking instead, sometimes running and sometimes to ride her quadbike. During summers Elsa enjoys going up on peaks and during wintertime she still goes to fish by snowmobile with her family quite often. Elsa thinks that her relationship with nature today and the time she spends in nature now is very influenced by her parents and also her aunt who was very adventurous and used to take her along on excursions. She knows that her parents have always enjoyed being outdoors, that her father grew up in the mountains, spending his summers in the summer chalet with the family sheep; and her mother always enjoyed being outdoors exploring with her friends; so she thinks her parents have always lived close to nature. Elsa is pleased with the amount of time she spends in nature and thinks that it would be easy for her to spend more time in nature if she wanted to. Her favourite place in nature is one of the family's cottages in the mountains that is in a very secluded area and close to a small lake, and with mountains surrounding it. She has also been trekking twice in one of the national parks in the mountains in northern Sweden, Abisko, so this is also a favourite for her, she thinks it might be because it is such beautiful and powerful nature and that it is new. When asked about a memorable nature experience Elsa first mentions the last time her family went to her favourite mountain cabin, and then adds when she went with a friend to the mountains in Abisko and they trekked part of the King’s trail; she says it is a very fond memory and that she often looks at pictures and videos from this occasion; she had dreamt of going there for a long time and felt that it was very powerful to finally get to go there. Her favourite smell in nature is from one of their cottages that is on an island in a lake and the smells there in summertime when someone is cooking food and they are swimming. It makes her think of that place that is very social, a small place with a lot of family and relatives.

As for the degree of connectedness to nature, Elsa thinks it is a difficult question, she feels a rather big connection since she spends a lot of time in nature; “A bit hard, actually like I am in nature a lot, rather big connection, I feel”. Elsa sees herself as a part of nature but thinks that she is more valuable than other parts of nature, such as a blade of grass [referring to one of the questions in the
CNS questionnaire], but she does care about nature. To her, nature is a place where she can relax, get away for a while and feel good; “Yes but I would say it mainly is that I get to relax, like when I’m out walking it’s just nature that I’m in and that I get all impressions from and no phone, or when I go to the forest or mountains, it’s relaxing and peaceful.”

Regarding animals and plants value compared to humans, Elsa thinks that if it would come to a situation where she needed to choose between saving an animal and a human, she would save the human; but she does not think that humans should exploit nature just to make things better for humans because all animals have a value, exemplifying with cutting down the rainforest. In her reflective text she adds the perspective that nature is important for the survival of humans:

I see nature’s value and the role it plays for us humans and for our survival. Animals, plants and nature have an enormous value but I will always think that humans have a greater value than for example as mentioned before, a strain of grass. Us humans must care for and protect nature and animals and we shouldn’t prioritise our interests if it results in harming animals and nature.

Concerning sustainability, Elsa thinks quite a lot about it, at least once a day. Her family recycles, and she also started eating less meat after watching several documentaries about the meat industry and how it affects animals and climate, about six months ago. She does not have access to public transportation, but she would definitely use it if it was possible. In the future, she could consider making some lifestyle changes to increase sustainability and protect nature, but not too radical “Yeah, but it, if I know that it’s real and you know some things yourself too really; but well it depends, now I’m almost a vegetarian but say if someone said we all needed to be vegan, that might be too much of a major lifestyle change.” To increase sustainability in society in the future, Elsa thinks that when she has her own household, she would try to buy as much or organically produced food as possible, use public transport or bicycle or walk, and continue recycling. She does not think that she is the kind of person that would drive sustainability change in society or at her workplace, but she would support those that did.

To summarise the most important information on the degree of nature connectedness, Elsa feels like a part of nature but more important than other parts of nature (medium NR-Self, 3.11 on the pre-NR scale, INS 4), she spends some time in nature most days during her walks (medium NR-Experience, 3.17 on the pre-scale), values the rest of nature (plants and animals) but not as high as humans, and thinks about and acts sustainably as well as is able to consider making some changes in his lifestyle to increase sustainability but not too radical (medium to high NR-Perspective, 4.17 on the pre-test and PEAB 3.07). Hence, the information received from the interview was congruent with Elsa’s score on the pre-NR-21.

In the post interview and post reflection, Elsa explained that her nature connectedness, her sustainability views as well as sustainability actions, were the same as in at the pre occasion. This matched well will with her post-NR-21 that was almost the same as her pre-score, just slightly increased, from 3.48 to 3.62 (post-NR-Self 3.56, post-NR-Perspective 4.00, post-NR-Experience 3.33), her PEAB however, increased from 3.07 to 3.75.

**CG Participant with Average Pre-NR-21 score (3.48), Evelina, Participant Number 31**

The other CG participant with an average score was 17-year-old Evelina, a cross country competitor with 3.48 on the pre-NR-21. Evelina grew up in the countryside with nature outside the door. When she was a kid, she played a lot in the forest and sometimes took walks in the forests with her grandparents. Nowadays she only does training in nature, mostly in forests and sometimes in the mountains, running in the summer and skiing in the winter; usually a few times per week; she does not spend time in nature outside of training. She spends less time in nature now than during her childhood.
She thinks she would like to spend more time in nature because currently she spends all of her time indoors except for training, not really knowing why. Evelina’s favourite places in nature are forests and mountains, since she likes training and scrambling. At first, she cannot think of a special or meaningful experience in nature, but then mentions winter springtime when you can ski anywhere on the crust of the snow, which she thinks is nice. She cannot think of any smell in nature that she likes.

Concerning her degree of nature connectedness, Evelina does not really feel that connected to nature, since she does not spend that much time in nature; but that it can vary, she feels a bit more connected when she is in nature. She does not know whether to consider herself a part of nature or not, she has not really thought about it. Evelina thinks nature is meaningful to her when she is able to spend time in it, since she likes to be in nature and since she grew up in. Being in nature makes her feel more relaxed and calmer if she has been stressing. She also finds nature fascinating.

Regarding plants’ and animals' value in relation to humans, Evelina thinks that animals and humans are very alike so therefore one should try to protect plants and animals as much as possible.

As for sustainability, Evelina does not think about it or do anything differently in her everyday life for sustainability; but she knows that it is important. She thinks that she could make some small changes in her lifestyle to increase sustainability and protect nature, but it would depend on what it was and how.

To summarise the most important information on the degree of nature connectedness, Evelina says nature is important to her and she feels a little bit connected to nature (medium NR-Self, pre-score was 3.33; INS 2), she spends some time in nature but only during training (which could make nature more of a backdrop) (medium NR-Experience, pre-score was 3.17), values the rest of nature (plants and animals) highly but does not think about or act sustainably in her everyday life; although being aware that it is important and could consider making some small changes in her lifestyle to increase sustainability; she also thinks it is important to protect animals and plants (medium NR-Perspective, score 4; and PEAB 2.98). Hence, the information received from the interview can be interpreted as being in line with Evelina’s pre-score on the NR-21.

In the post interview and reflection, Evelina said that her nature connectedness, her sustainability views as well as sustainability actions, all remained the same as at the pre occasion. However, she explained that participating in the interview and making the drawing, had made her more aware of that she spends less time in nature in her current place of stay, than she did when staying with her parents where nature was all around and not any other houses, which made her realise that she is not as close to nature as she used to be. When asked if she thought this was the reason for her lower post-NR-21 score, she said this was probable, because she did not think that her actual connectedness to nature had changed, only her view of it. Although she made clear that she was happy living where she did now because it had many other benefits, and it was possible to get to beautiful nature places within a short amount of time. This explained Evelina’s lower post-NR-21 score, the score went from 3.48 to 3.00 (post-NR-Self 2.56, post-NR-Perspective 4.00, post-NR-Experience 2.67) and PEAB from pre 2.98 to post 2.32.

**CG Participant with Average CG Pre-NR-21, 3.43, Tilde (CG 9), Post 3.62**

Tilde, one of the CG participants with average CG pre-NR-21 score (female) was not among the participants interviewed but wrote a pre-reflection on her nature connectedness and sustainability views and actions that was mostly uniform with the other CG participants with average pre-NR-21 scores; she spends some time in nature, it is calming to her, but she does not actually see herself as a part of nature. Just like Evelina, but contrary to Elsa; Tilde does not think about or act sustainably in
her everyday life. Just like the other CG participants, Tilde stated in her post-reflection and post-interview that nothing had changed, which was compatible with her slightly increased post-NR-21.

In her pre-reflection, Tilde described spending a lot of time in the forest when she was growing up, she still spends quite a lot of time in the forest nowadays, just walking around philosophising a couple of times a week, except for during the wintertime. During summertime she also goes swimming and in the wintertime she goes snowmobiling, fishing and skiing.

For Tilde, nature is a place where she can feel calm and relaxed, especially in the forest where she feels like she becomes part of something bigger and gets perspective on things:

Nature is a place where I can feel calm and relax, especially in the forest. You become a part of something bigger when you’re there with all the plants and animals. You get more perspective and it’s a good place to go if you need to think and reflect. I’m positively affected by nature because I can think more easily and not have to stress.

She expresses her sense of closeness to nature scale wise, as a seven on a ten-degree scale, although adding she can feel as a part of nature once she is in it; but then adds, she is not a part of nature, but can feel involved in it; “On a scale from one to ten, maybe a seven, but once I’m out there I can feel as a part of nature. I usually don’t think about it, but once I’m out in it I feel more involved, but not as a part of it.”. As for the value of nature compared to humans, Tilde is clear that both should be prioritised to some extent and that currently humans are not prioritising nature enough; “Animals and nature should be preserved and protected. Humans should be able to develop but not at the rate we have now since it wears on animals and plant life.”.

When it comes to sustainability, this is not something that she thinks about or tries to adapt her everyday life actions to. On the theme related to what future actions she could consider doing to contribute to a more sustainable society; Tilde says she could consider eating less meat, using public transportation, buy second hand, recycle and reduce food waste. Additionally, she could take part of new research on what she can do to preserve nature at the same time as having a life adapted to society. As for her future work life, Tilde thinks it would be good if she was able to walk to work and perhaps try to inspire people at her workplace to become more sustainable. She could also consider joining scrap picking activities or working with environmental politics.

In her post-reflection, Tilde made clear that nothing had changed from her pre-reflection writing. This was compatible with her post-NR-21 that had just increased slightly by 0.19, although her PEAB had dropped from 3.65 to 3.05.

**IG Participant with One of the Lowest Pre-NR-21 (2.67), Emma, Participant Number Eight**

One of the two participants with the lowest pre-NR-21 score, 2.67, was 16-year-old Emma. Emma grew up in the countryside and thinks she spent quite a bit of time in nature when growing up, playing in the forest with her sister and her cousins and going for walks with her mom and grandmother and grandfather, sometimes grilling sausages or just being out. Currently she does not spend that much time in nature but tries to get out about once a week for a walk or picking berries when they are in season. Emma is content with the amount of time she spends in nature but could maybe consider spending a little more time outdoors. She thinks for a while when asked if she has a favourite spot in nature and then says it is the patch of hilly woods with big rocks behind her grandparents’ house, a place she used to play at when she was a child. She does not really have any memorable nature experience but considers picking berries with her grandparents could be it “No, actually, it’s like, picking berries with grandma and grandpa, sort of”. A favourite nature smell she can think of is freshly cut trees.

Emma thinks it is difficult to describe her degree of connectedness to nature but would describe it as medium, she is clear about that she does not see herself as a part of nature but as separate
from it. Emma thinks nature is a good place to relax “It’s like, you can go there and relax I think and not get bothered by anything, like listen to animals and the sound of the wind blowing in branches and such … I’d say I get calm”. In her reflective text she writes: “Nature makes me feel a kind of calmness and safety. It means quite a lot since it’s a place that you can go to if you want to be by yourself.”

As regards to how much nature’s (plants and animals) interests are to be considered Emma simply answered, “Medium I think”.

When it comes to sustainability, Emma has not really thought about this that much, but she thinks she could consider making some lifestyle changes if it would be necessary to save nature (plants and animals). In her reflective texts she ponders future sustainability actions such as reducing the amount of car rides and perhaps trying to not buy unnecessary things. As a member of an association, she could try to influence it so that no unnecessary purchases are done.

To summarise the most important information on the degree of nature connectedness, Emma says she feels medium connected to nature but separate from it (indicating low NR-Self, pre-score was 2.11; INS 3), she does not spend much time in nature (low NR-Experience, pre-score was 2.67), values the rest of nature (plants and animals) to some extent, does not really think or act sustainably; but is able to consider some lifestyle changes to increase sustainability (low to medium NR-Perspective, pre-score was 3.5; and PEAB 3.15). Hence, the information received from the interview can be interpreted as being in line with Emma’s score on the NR-21.

In the post-interview, Emma described her nature connectedness as the same except that she was more aware of nature’s importance and therefore valued it higher. When asked about if she saw herself as a part of nature she answered: “I’m not sure, maybe, but I definitely belong in nature.”. Emma’s post-reflection shows greater awareness of how important nature is and of sustainability problems. She shows a stronger nature connectedness than in her pre-reflection by emphasising that she thinks that humans do not appreciate nature as much as they should, and she describes nature as more important to her:

I feel rather close to nature, I like being outdoors. It feels like us humans don’t appreciate nature as much as we should, at least that’s how I often feel. Then I usually stop for a moment and just take in all the niceness around me, listen to the birds and all the other sounds. In that way it’s easy to appreciate such small things as the chirp of a bird, you feel that life’s worth living. Nature makes me feel like I belong on earth, it gives me meaning.

Emma still describes it as important to protect nature but now also emphasises that humans cannot live without nature, that for example produces oxygen. Hence showing a greater understanding of and appreciation of nature. Emma also says that since learning about sustainability issues, she thinks more about these issues and is more motivated to act sustainably in the future. That Emma did not feel a greater nature connectedness was congruent with her NR-21 score that remained at 2.67 67 (post-NR-Self: 2.22, post-NR-Perspective: 3.17, post-NR-Experience: 2.83), however her PEAB increased from 3 to 3.5, in line with her greater understanding and sympathy for sustainability.

**IG Participant with One of the Lowest Pre-NR-21 (2.67), Erika, Participant Number Five**

The other participant with the lowest pre-NR-22 score was Erika, 16 years old, also 2.67 on the NR-21. Erika grew up in the countryside, she thinks she spent quite a lot of time in nature when she was growing up since her family used to go fishing with snowmobiles and she also competed in alpine skiing. They would also sometimes pick berries and mushrooms or go look at a waterfall. Nowadays, Erika spends less time in nature than when growing up; “Yeah, no it’s less. One doesn’t think it’s as much fun to spend time with the family anymore, or it depends on what it is, but it’s more fun to go out for a barbeque with friends than with family”. In her reflective text, she is franker about not actually spending that much time in nature currently.
When asked if she is content with the amount of time spent in nature Erika says that she is, since nature is available right outside her door, she could easily spend more time outdoors. But she thinks it is hard to think of things to do there with her friends, which makes her think of a trek in the mountains in 9th grade that she really enjoyed and changes her mind a little; “But I would like to do more experiences, like when we did a trek in the mountains in 9th grade, one would like to do that again. It was nice and fun, one had a very imaginative mind when being up there and in part it’s nice to be out hiking too.” Erika does not really know if she has a favourite place in nature but decides where she lives is it, since it is easy to go out and do things; snowmobiling, swimming, or exploring and finding new places. When asked about a memorable experience in nature, Erika returns to the mountain trek in 9th grade but also adds snowmobile fishing trips in nice weather in the wintertime with family and relatives. Erika enjoys the smell of fresh mountain water from a clear stream, she thinks it smells like the light is coming.

Erika does not see herself as close to nature, but still thinks she is medium connected to nature since she lives in it and does things in nature sometimes; “I’d say I’m in the middle, because I’m not that close to nature, but not so damn far apart from it either, since I live in nature and one does things out in it, so I’d say medium”. She is clear on that she does not consider herself a part of nature, but separate from it. She does not really think that nature has any specific meaning to her although she does not want it to disappear; “Ehh, well, I’d say it doesn’t have any real meaning, but you don’t want it to disappear, but you want to keep it. But no, I don’t know, I don’t think so”. When it comes to the effects of nature, Erika thinks it is relaxing, and just as Freja, a place where you can be yourself:

Really, one gets calmer from being in nature I’d say, you stop like thinking, or maybe you can’t say that, but you’re not like stressed in nature, which you are like here. But in 9th grade when we trekked in the mountains you didn’t think of anything, it was very nice to just not have to, I don’t know how to explain, but you didn’t have to think about the way you looked or like when you’re in school; you can be yourself even more.

In her reflective test, she describes that her mood is affected by the weather or what nature looks like; for example, if there is an overcast she can feel less good, but if it’s sunny she usually feels happier.

Concerning nature’s value, how to prioritise the interests of animals and nature in relation to human interest, Erika thinks human interests should be prioritised but also nature to some extent since it would be sad if nature disappeared and it is useful to humans:

No but really, surely you should prioritise humans, but also nature because it would have been very sad if it disappeared. Like animals, we actually have use of those, and it would have been very sad to live somewhere where there wasn’t nature, animals and plants to look at. So, nature should be taken into account as well, but not prioritised as much.

As for sustainability, Erika has not really thought much about this although she does know it is a problem, she thinks it is something adults think more about. When it comes to changing lifestyle in order to increase sustainability and save nature, Erika says she would like to help but it would be difficult to change lifestyle abruptly, but she would have done what she could to help.

To summarise the most important information on the degree of nature connectedness, Erika says she feels medium connected to nature but separate from it (indicating low NR-Self, pre-score was 2.56; INS 3), she does not spends much time in nature except for occasionally, mostly snowmobile fishing trips (low NR-Experience, pre-score was 2.17), only values the rest of nature (plants and animals) to some extent and mostly from the perspective of usefulness or pleasure for humans, and does not really think or act sustainably; but is able to consider making some lifestyle changes to increase sustainability (low to medium NR-Perspective, pre-score was 3.33; PEAB 2.84). Hence, the information received from the interview can be interpreted as being in line with Erika’s score on the NR-21.
In the post interview and reflection, Erika explained that she felt slightly closer to nature and that she definitely valued it higher, she still saw herself as in between being a part of nature and not. She now thinks that both human and nature should be prioritised and shows an awareness that humans are dependent on nature: ‘I’d say that both nature and humans are worth the same, because if animals and nature disappear, man wouldn’t be able to survive. So I’d say you need to both protect nature, but humans should also be able to live and do their interests.” Erika emphasized that she had learnt quite a lot and had become more aware of the state that nature is in, and nature’s importance for humans, which made her feel more motivated to act sustainably in the future. She cannot really think about what she would be able to do herself, but she thinks it would be a good idea to always keep in mind how actions affect nature and animals, before deciding how to act. This is congruent with her post-NR-21 score that increased from 2.67 to 3.19 (post-NR-Self: 3.11, post-NR-Perspective: 3.17, post-NR-Experience: 3.33) and her PEAB that increased from 2.84 to 3.39.

**IG Participant with the Third Lowest IG Pre-NR-21, 2.86, Alfred (IG 2), Post 2.90**

Alfred, the IG participant with the third lowest IG pre-NR-21 score (male) was not among the participants interviewed but wrote a pre-reflection on his nature connectedness and sustainability views and actions that corresponded to some extent with the other IG participants with low pre-NR-21 scores; he spends some time in nature; although mostly on his dirtbike; but does not seem to see nature as important the same way as the other two participants do; just like them, he does not see himself as a part of nature; and just like the other two IG low NR-21 score participants, Emma and Erika, Alfred does not think about or act sustainably in his everyday life. In his post-reflection, Alfred describes his nature connectedness as low and unchanged, and he still does not see himself as a part of nature. However, he thinks that his view of nature’s value has increased, he now values nature quite highly. He also thinks about sustainability issues now although have not started acting sustainably.

In his pre-reflection, Alfred describes spending some time in nature, when he does so, he usually drives his dirtbike and sometimes goes running. He thinks that his relationship to nature is weak although he would not go so far as to say he does not care about it since he spends some time in it, which is why he thinks he at least has a weak relationship with nature; “My relationship to nature is weak, I wouldn’t say I don’t care about nature but I spend some time in it so I’d say I have a weak relationship with it.” Alfred sees himself as separate from nature and thinks that humans have a higher value than nature, plants and animals.

As for sustainability, this is not something that Alfred either thinks about or acts for. To increase sustainability in society in the future, he could consider thinking more about how he transports himself and decrease littering. In his association he would do absolutely nothing.

In his post-reflection, Alfred stated that he had learnt that we need to act now on sustainability issues which had to some extent had an effect on his view of nature’s importance and sustainability issues.

In his post-reflection, Alfred describes his nature connectedness as low and unchanged, and he still does not see himself as a part of nature. However, he thinks that his view of nature’s value has increased, he now values nature quite highly. He also thinks about sustainability issues now although have not started acting sustainably since still living at home. In the future when he has his own household he would like to start recycling, transport himself by bike, try not to buy plastic, and think about the food choices he makes (buying locally produced and organic). He would also like to influence others to do the same. This seems congruent with Alfred’s only slightly increased NR-21 score, from 2.86 to 2.9 and PEAB from 2.67 to 2.75.

**CG Participant with the lowest Pre-NR-21 (2.21), Karl, Participant Number 26**
The CG participant with the lowest pre-NR-21 score, 2.21, was Karl, a 17-years old alpine skiing competitor. Karl grew up in a suburb but with a forest and a lake near the house. When growing up he used to spend a little time in nature, mostly building treehouses and playing with his friend, a neighbouring child, but also during alpine skiing training. He did not spend time in nature with his parents except for in the ski slopes during holidays. Nowadays Karl only spends time in nature during alpine skiing training which he does almost every day, either skiing in the slopes or running in the forest, which he prefers to indoor training. Occasionally though he might do a barbeque with friends in nature. He thinks the time he spends in nature now is rather equal to the time he spent in his childhood, the only difference being that then he played and now he trains. A favourite place in nature is a ski resort on a mountain where he used to ski a lot when growing up, since it has a nice view and brings back memories from his childhood. Karl thinks for a while when asked for a memorable experience in nature and then finally decides on one of the training days in a local ski slope when reindeer came running into the slope, standing all over it, which he thought was kind of fun. He thinks the smell of trees and resin are good nature smells since they are characteristic positive nature smells to him, reminding him of playing in the forest as a child.

When asked about the degree of connectedness that Karl feels with nature, he talks about feeling that he is a part of the global warming and that it would be sad if there would not be any snow, because then he could not ski; “Feel that when one is out on the mountain, that you’re really part of the global warming and that the snow is taking a beating, it’s really visible. Before I started upper secondary school, the last few years, so much has happened, you become aware that there’s problems, you want to be able to ski, you don’t want to lose the snow. Snow conditions have deteriorated a lot, that’s sad.”. Karl does not see himself as part of nature; “I’m not a part of nature, I live in my house and nature is a bit away”. He sees nature as very important from a utility perspective in the sense that he is an alpine skier; “It has a big importance since I do alpine skiing, it’s a big part of life when you do alpine skiing so in that way it means quite a lot. Nature’s important to me because I ski alpine skiing and then you need nature to have a ski slope to go down.”. When asked about how nature affects him, Karl replies that it makes him feel happy when he stands on his skis at the top of a mountain with a nice view, the sun is shining and he is ready to ski down.

As for the value of plants and animals in relation to humans, Karl says he thinks all animals should be allowed to exist; “Think that different races should exist, the same as for humans, it’s not good if one goes extinct. All animals and humans should be allowed to live their lives at least. It’s important that those who are threatened with extinction live their lives too and become more so that they’re not threatened.”. He explains further: “I think you must find a middle way so that my interests such as alpine skiing, you should be able do that, but also that no animals take a beating because of it.”

Concerning sustainability, Karl says that he thinks some about this but not a lot, his family has a hybrid car which he thinks is a bit more sustainable and he thinks about global warming quite a lot since if it increases too much the snow will disappear; “You think about it quite often, if global warming gets too strong, there won’t be any winter left”. But he does not really think about living sustainably and does not act sustainably. When asked if he could consider making any lifestyle changes to increase sustainability and protect animals and plants, he replies he could probably change a little, because he would want that if he was the animal or plant under threat of extinction; “One could probably change a little, if I was that animal or that plant that was about to become extinct I’d like others to change for my sake, so I guess it’s only fair that I do the same in return”.

To summarise the information on the degree of nature connectedness, Karl sees nature as important since he likes to do alpine skiing and he does not want snow to disappear, mostly from a utility perspective; and he does not see himself as a part of nature (indicating low NR-Self, pre was 2;
INS 2), he only spends time in nature during training, which risks making nature just a backdrop (Mikaels, 2019) or a track (Lisberg Jensen & Ouis, 2014), see chapter 2.2 (indicating low to medium NR-Experience, pre was 2.5; PEAB 2.02), Karl thinks that all species should be allowed to live their lives, he mainly thinks about sustainability from the perspective that global warming is a threat to snow conditions and thereby his alpine skiing, but does not appear to think about how he could act sustainably nor acts sustainably in his everyday life; he could consider making small lifestyle changes to protect nature and plants since he thinks all species should be allowed to exist (showing both medium and low NR-Perspective, medium in theory (values animals and plants but mostly thinks of nature's value as in the snow conditions he wants for personal use) and lower in practice (does not act sustainably and could only consider making small changes); pre was 2.33). Hence, the information received from the interview can be interpreted as being in line with Karl’s pre-NR-21.

In the post interview and reflection, Karl said that his nature connectedness, his sustainability views as well as his sustainability actions, all remained the same as at the pre occasion. This matched rather well will his just slightly increased post-NR-21, his score went from 2.21 to 2.43, which is still low (post-NR-Self 1.89, post-NR-Perspective 2.83, post-NR-Experience 2.83); however his PEAB had increased from 2.02 to 2.71.

CG Participant with the second lowest Pre-NR-21 (2.67), Anna, Participant number 15

The CG participant with the second lowest pre-NR-21 score, 2.67, was Anna. Anna grew up in what she thinks was a mix of countryside and suburb. When growing up, she did not spend much time in nature except for the occasional picking of mushrooms or skiing. Nowadays Anna doesn’t spend time in nature unless there was a field day at school or orienteering in sports class at school; she thinks this is comparable to the amount of time that she spent in nature as a child and she is content with the amount. Anna described that being in nature is not something that she does voluntarily, although she does think it is beautiful and enjoys looking at it; “I’m not the kind of person that voluntarily goes out in the woods to pick berries or to camp. It’s not something that I prefer to do. But I do think that nature is very beautiful, and I like looking at it.”. She appreciates the smell of nature; “nature smells cleaner and more like forest, that’s nice”.

Anna is unsure how to describe her relationship with nature or degree of connectedness but replies with a number, a 5 on a 1-10 scale. When asked if she sees herself as a part of nature or separate from it, she replies “in between”. Nature doesn’t have any particular meaning or importance to her. She does not feel like she is affected in any way by being in nature, neither does she have a special place in nature or a memorable experience in nature.

When asked about how to prioritise between the interests of plants and animals and the interests of humans, she thinks both are important.

As for sustainability, she says she does not think about it but of course she would not throw trash in nature. She could consider making small lifestyle changes in order to increase sustainability, to protect animals and plants.

To summarise the most important information on the degree of nature connectedness, Anna says she feels medium connected to nature but does not think that nature has any importance or meaning (indicating low NR-Self, pre-score was 2.22; INS 2), she does not really spend any time in nature except for occasional school activities (low NR-Experience, pre-score was 1.67), thinks that natures and humans interests should be considered equally but does not think or act sustainably in her everyday life; although could consider making small lifestyle changes to increase sustainability (showing both high and low NR-Perspective, higher in theory (value of nature compared to humans, pro-environmental attitude) and lower in practice (acting sustainably, pro-environmental behaviour);
pre-score was 4.33) and PEAB 2.52. Hence, the information received from the interview can be interpreted as being in line with Anna’s score on the pre-NR-21.

In the post-interview, Anna said that she felt the same about her nature connectedness and her views on and lack of action for sustainability also remained the same. This was in line with her post-NR-21, 2.76, just slightly higher (0.09) than her pre-score of 2.67 (post-NR-Self 2.33, post-NR-Perspective 4.0, post-NR-Experience 2.17), and slightly increased PEAB, from 2.52 to 2.61

CG Participant with the Third Lowest CG Pre-NR-21, 2.81, Anders (CG 18), Post 3.24

Anders, the CG participant with the third lowest CG pre-NR-21 score, male cross country skiing competitor, was not among the participants interviewed, he wrote a pre-reflection on his nature connectedness and sustainability views and actions that to in some ways corresponded with some of the other CG participants with low pre-NR-21 scores and in other ways differed. Anders spends quite a lot of time in nature training just as Karl but conversely from Anna; Anders thinks that human interests should be prioritised but that animals should be considered to some extent, similar to Karl and Anna that thought there should be a middle way. Contrary from Karl and Anna, Anders sees himself as a part of nature. And contrary to Karl and Anna, Anders thinks a little about sustainability in his everyday life and somewhat tries to adapt a little to this. Just like the other CG participants, Anders stated in his post-reflection that nothing has changed which is also what he stated in the interview, however, his post-NR-21 was a bit higher, up by 0.43 to 3.24, a score that seemed more compatible with both his pre- and post-reflection.

Anders thinks he has a good relationship to nature since he has lived in the countryside all his life and is out in the forest a lot when training and likes to be there; “My relationship to nature is good since I’ve lived in the countryside all my life. I’m out a lot in forests and nature and like being there.”. He sees himself as a part of nature but thinks that humans’ interests should be prioritised above the interests of animals, although adding they should not be forgotten or maltreated.; “I first and foremost think that humans should be prioritised above animals, though they shouldn’t be forgotten or maltreated.”.

Concerning sustainability, Anders does think about this since it is a big part of everyday life, especially as a skier he notices how snow conditions have deteriorated over the years. As for sustainability actions, he tries to be sustainable but thinks it is difficult to prioritise as a youth with a very limited economy and sometimes not being the one that makes the decisions; he tries to think about what he buys and eats in terms of sustainability, and he does not litter. To contribute to a more sustainable society, in the future, he could consider his choice of profession in terms of sustainability and try to make sure his ski association does not have a negative impact on nature.

In his post-reflection, Anders stated that nothing had changed from his pre-reflection although his post-NR-21 score was up by 0.43 to 3.24. The post-NR-21 score seemed more compatible with what Anders wrote in his pre- and post-reflection, it could be that he just made some mistakes while filling out the first NR-21 questionnaire; since he claims nothing has changed, Anders’ reflection contained quite a few misspelt words indicating trouble with reading and writing, which could increase the risk of misinterpreting questions and he appeared rushed at the time of filling out the pre-questionnaire. His PEAB increased from 2.95 to 3.5.

5.3 Individual Examples of Drawings

What stood out the most when analysing the pre-intervention drawings was that all the participants with the highest pre-NR-21 scores; both in IG and CG; drew a picture of themselves in nature, doing something that they enjoyed in a place that they liked. This was also the case for most of
the average scoring participants (that had slightly higher than neutral nature connectedness scores). None of the IG participants with the lowest pre-NR-21 scores drew themselves in nature, however, the CG participants with the lowest pre-NR-21 scores did draw themselves in nature; although not in the most natural settings; Karl drew himself training slalom in a ski slope (with plenty of non-natural elements such as ski ports); Anders drew himself growing vegetables by a house in the countryside (which is a cultivated environment looking more like a village than undisturbed nature); and Anna just drew a stick-figure representing herself, a thumbs up and a tree (interpreting her accompanying text, representing nature), she was not actually doing anything in nature or drawing an actual place.

In the post-drawings however, only two of the IG participants drew themselves (Freja, high pre-Nr-21; and William, average pre-NR-21). But in the CG, five participants drew themselves (high pre-NR-21 Madeleine and Hanna; average pre-NR-21 Tilde; and low pre-NR-21 Karl and Anders). A total of 7 participants. Evelina (CG average pre-Nr-21) once again drew a tree as a symbolic self. Klara (high CG pre-NR-21) drew Adam and Eve as representatives of wanting to live close to nature.

Table 9:
Objects Appearing at Least Once in Drawings

<table>
<thead>
<tr>
<th>Objects</th>
<th>Intervention Group</th>
<th>Control Group</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pre High</td>
<td>Avg.</td>
</tr>
<tr>
<td>Humans total</td>
<td>3 3 0</td>
<td>1 1 0</td>
</tr>
<tr>
<td>Themselfs</td>
<td>3 2 0</td>
<td>1 1 0</td>
</tr>
<tr>
<td>Symbolic self</td>
<td>0 1 0</td>
<td>0 0 0</td>
</tr>
<tr>
<td>Other humans</td>
<td>0 0 0</td>
<td>0 0 0</td>
</tr>
<tr>
<td>Trees</td>
<td>3 2 2</td>
<td>3 2 2</td>
</tr>
<tr>
<td>Green ground</td>
<td>2 2 1</td>
<td>3 2 1</td>
</tr>
<tr>
<td>Sun/Sunlight</td>
<td>3 3 2</td>
<td>2 1 3</td>
</tr>
<tr>
<td>Water</td>
<td>1 3 2</td>
<td>2 2 2</td>
</tr>
<tr>
<td>Mountains</td>
<td>3 2 1</td>
<td>2 2 1</td>
</tr>
<tr>
<td>Snow</td>
<td>1 2 1</td>
<td>1 2 0</td>
</tr>
<tr>
<td>Flowers</td>
<td>0 0 0</td>
<td>0 0 0</td>
</tr>
<tr>
<td>Berry bush/Fruit</td>
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<td>0 0 0</td>
</tr>
<tr>
<td>Mushrooms</td>
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<td>0 0 0</td>
</tr>
<tr>
<td>Animals</td>
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<tr>
<td>Total NE</td>
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<td>14 13 9</td>
</tr>
<tr>
<td>Non-Natural Elements</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trail markers</td>
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<td>0 0 0</td>
</tr>
<tr>
<td>Buildings</td>
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<td>1 0 1</td>
</tr>
<tr>
<td>Ski ports</td>
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</tr>
<tr>
<td>Campfire</td>
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<td>1 1 1</td>
</tr>
<tr>
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<td>Bicycle</td>
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<tr>
<td>Boat</td>
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<tr>
<td>Lighthouse</td>
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</tr>
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<td>Ski lift</td>
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<tr>
<td>Field/Garden</td>
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</tr>
<tr>
<td>Swing</td>
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<tr>
<td>Tent</td>
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<tr>
<td>Jet ski</td>
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<tr>
<td>Swim Ring</td>
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<tr>
<td>Pier</td>
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<td>0 0 1</td>
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<tr>
<td>Total NNE</td>
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<td>4 2 4</td>
</tr>
</tbody>
</table>

As for the post-intervention drawings, it was clear that almost all the CG participants chose similar motives and explanations; the ones that drew different motives explained these as complementing the previous view (Elsa and Tilde that both drew cottages in one drawing and views near the cottage in the other drawing; or were of a similar kind; Anders drawing two different countryside motives of cultivated areas); except for Klara who drew a completely different motive but portraying the same level of feeling connected to nature. In the IG however, most participants chose
different post-motives; paired with the writing, some of the IG participants expressed a closer relationship with nature (IG pre-NR-21, High: Vera (not in the actual drawing but in the writing explaining how the motive represents the shaping of her relationship with nature and it’s closeness), Julia; Average: David (not seen in the actual drawing that similarly showed an activity he enjoys doing in nature; but in the writing that expressed a love for nature), William; Low: Erika) and some expressed a similar nature connectedness as before the intervention (IG pre-NR-21, High: Freja; Average: Erik; Low: Emma, Alfred (his drawing was difficult to compare to the first one, the post-drawing was much more colourful and detailed but not comparable to the more symbolic drawn letters in the pre-drawing; additionally, his writing did not show any clear signs of increased nature connectedness and nor did his post-NR-21)). It was difficult to try to interpret any changes in nature connectedness from just looking at the drawings; the counting of objects did not show any clear patterns between the number of objects and changes in degree of nature connectedness, although higher pre-NR-21 tended to be associated with a higher number of natural objects (see table 9). The accompanying writing helped to interpret the degree of nature connectedness only to some extent, sometimes the participants just chose entirely different motives in the post-drawing, making it difficult to compare the drawings for changes in nature connectedness. However, the drawings did give new insights and perspectives on the participant’s nature connectedness, and showed clear differences between high pre-NR-21 and low pre-NR-21 participants, generally matching participant’s NR-21.

IG Participant 30 with the Highest IG Pre-NR-21 score, Freja, Pre 4.43, Post 4.57

Freja’s pre-intervention drawing showed her skiing down from a mountain that she and her family has a tradition of skiing up in the springtime when the weather is good. That she drew herself in a nature area that her family has a traditional ski tour in can be interpreted as showing that she spends a lot of time in nature and that she enjoys doing that. Freja’s captured the look of the area really well, which could show that she spends a lot of time there, and in nature in general, and that she pays attention to nature when in it. The drawing matched Freja’s pre NR-21, interview, and reflection.

Freja’s post-intervention drawing shows her and her family camping in a mountain clearing that they spent time in camping a few years ago. It depicts them sitting by the tent and fishing, which she explains in her writing was what they were doing when they were there. Freja’s drawn a detailed drawing of the mountain scenery, trees, and a lake. The motive and the explanation is similar to the pre-drawing, Freja is out in the same mountain area doing activities with her family (just in a different season). The drawing matches Freja’s similar, just slightly higher, NR-21, pre: 4.43; post: 4.57.
IG Participant 26 with the Second Highest IG Pre-NR-21 score, Vera, Pre 4.40, Post 4.62

Vera’s pre-intervention drawing shows her standing on top of a mountain, surrounded by mountains, trees, trail markings, and a sunset and she explained that this freedom in the mountains made her feel joy and happiness. It can be interpreted very similarly to Freja’s drawing; she drew herself in nature and clearly this is something she enjoys, which can easily be interpreted into that she spends a lot of time in nature and enjoys this. Just like Freja, Vera’s drawing is very representative and shows that she has probably spent a lot of time in the mountains and that she pays attention to the scenery, probably catching the sunset many times since she captured it really well. The drawing matches well with Vera’s pre-NR-21 score and the previously analysed pre-intervention material.

Vera’s post-intervention drawing depicts her family’s farm where she grew up and which she explains in her writing was where her very strong relationship to nature took shape from playing around a lot outdoors in nature. The motive is different from the pre-drawing but similarly shows her strong relationship to nature, this time focusing on its origin; additionally, she more clearly expresses that she has a very strong relationship to nature. It is clear that nature has been important to her during her whole life, and she thinks her family’s home; where this relationship developed, is a good symbol of her close relationship to nature. Vera’s post-intervention drawing matches well with her increased NR-21 score, pre: 4.40, post: 4.62.

IG Participant 19 with the Third Highest IG Pre-NR-21 score, Sara, Pre 4.00, Post 4.38

Pre-Drawing: “The drawing shows what I like to do in nature. Although orienteering is just one of the things I like doing out in nature. You see both forests and mountains. It’s when I’m out moving about in nature that I feel the best connectedness.”

Post-Drawing: “I think it’s really wonderful to go hiking in the mountains, it’s enjoyable to be in the mountains with fresh air and a fantastic view. Therefore the mountains symbolise nature to me. I’ve grown up with mountains and nature around me.”
Sara’s pre-intervention drawing shows her in a forested mountain area doing orienteering, which she points out is just one of the activities that she likes to do in nature. She also mentions that she feels the closest to nature when she is actually in it. Sara’s drawing can be interpreted very similarly to Freja’s and Vera’s, Sara’s drawing could also be interpreted as her spending a lot of time in nature and enjoying doing so since she drew herself in nature doing an activity, which she explained was just one among many. Additionally, just like Freja and Vera, Sara’s drawing shows that she spent a lot of time in nature and took notice of the natural surroundings, since she drew a detailed drawing of a natural area with both trees, mountains, water, rocks and a sunset. The drawing matches well with Sara’s pre-NR-21 score and the previously analysed pre-intervention material.

Sara’s post-intervention drawing depicts a mountain area with a sunset, trees, and rivers. It is more detailed and colourful than her first drawing. She describes that she really enjoys being in the mountains and that therefore they symbolise nature to her, also that she has grown up with mountains and other types of nature around her. Both the drawing itself and the writing show a stronger nature connectedness than the pre-drawing and text. Sara’s post-intervention drawing matches well with her increased NR-21 score, pre: 4.00, post: 4.38.

**CG Participant 21 with the Highest CG Pre-NR-21 score, Madeleine, Pre 4.48, Post 4.52**

Madeleine’s pre-drawing showed her in a natural mountain area with mountains, a lake, green grass, flowers and birds. She explained that she wanted to show that she feels good being in nature, that she likes to be in nature, and that she thinks nature is beautiful and should be preserved. Her drawing is similar to the IG participants with high pre-NR-21 scores and can be interpreted the same way. It is clear that she spends a lot of time in nature and that she enjoys it, since she drew herself in nature and that she drew the nature area with detail; this interpretation of her drawing is confirmed by her written comment. The drawing matches well with Madeleine’s pre-NR-21 score and the previously analysed pre-intervention material.

Madeleine’s post-drawing was very similar to her first drawing, only missing the flowers, having less mountain peaks, and instead adding a sun. She commented that she wanted to show that she feels close to nature, that she likes to be in nature, and that she wants to treat nature with dignity and as good as possible. The drawing indicated that her nature connectedness remained the same, which is also what she said in the post-interview and her post-reflective text. Madeleine’s post-NR-21 was almost the same, just marginally higher, it went from 4.48 to 4.52. Hence, both the NR-21 scores and all the other analysed material indicated that her nature connectedness remained unchanged.
CG Participant 6 with the Second Highest CG Pre-NR-21 score, Klara, Pre 4.05, Post 3.86

Klara’s pre-drawing showed her at one of her favourite places in nature, the climbing tree where she used to climb as a child, and she describes that it made her happy then and still today. The drawing is somewhat different from the previously analysed high pre-NR-21 participants in that it depicts a place that she mostly used to go to in her childhood and that it is only a single tree and some grass and Klara herself, not a nature scenery like the other drawings. This seems to confirm the information from the interview and the reflective text; that Klara used to spend a lot of time in the forest and by the climbing tree when growing up, but that she does not spend time in nature anymore. To her, the climbing tree of her childhood seems to symbolise, and bring back memories of, the nature experiences she had when growing up. The climbing tree makes Klara happy, and it and nature in general is still very important to Klara although she does not actively spend time in nature nowadays. The drawing matches well with Klara’s pre-NR-21 score and the previously analysed pre-material.

Klara’s post-intervention drawing was different from her first but reflecting the same kind of values that were seen in the interview and her reflective text. The post-drawing was of Adam and Eve in the garden of Eden, enjoying nature’s abundance; which Klara declared was how she wanted to live, in the moment and enjoying nature’s riches. This can be interpreted as wanting to live near nature and is in line with the interviews and reflective texts of Klara, as well as her pre-NR-21 (4.05) and similar post-NR-21 (3.86), that show that she thinks nature is very important and that this has not changed.

CG Participant 20 with the Third Highest CG Pre-NR-21 score, Hanna, Pre 4.00, Post 3.29

Hanna’s pre-drawing showed her by a cabin in the woods, the sun is shining. It’s got all conveniences but is secluded from the outside world. The post-drawing is being near all the amenities but still in nature.
Hanna’s pre-drawing depicts her in a sunchair by a cabin near a lake in the woods, she points out that the cabin has got all the conveniences but still is secluded from the outside world. This can be interpreted as that Hanna enjoys spending time in secluded nature areas, showing a strong degree of nature connectedness. The drawing matches well with Hanna’s pre-NR-21 score and her reflection.

Hanna’s post-intervention drawing was almost exactly the same as her first drawing, only adding a couple more trees; and the explanation was very similar as well. This indicated an unchanged degree of nature connectedness which is also what she wrote in her post-reflection. Hanna’s post-NR21 was lower, it went from 4.00 to 3.24. It is impossible to know if she just misread some questions or had different experiences that somehow affected her on the day of the post-test. Both her reflections and her drawings indicated a rather high degree of nature connectedness so it is not possible to find an explanation to her lower post-NR21 score in the information gathered. Hence, it is unclear whether Hanna’s nature connectedness decreased in general or just at the day of filling in the post-questionnaire, or if it was temporarily increased the day of filling in the pre-questionnaire, or if she just made some mistakes while filling in the questionnaire; either the pre or the post one. However, her reflections and her drawings match better with her higher pre-NR-21 score.

**IG Participant 21 with Average IG Pre-NR-21 score, Erik, Pre 3.48, Post 3.67**

**Pre-Drawing:**
“Motive: A common goldeneye [sea duck] that’s looking out over the ocean. The common goldeneye gets to symbolise me and the ocean nature. Just like the common goldeneye I love the ocean and I’m there a lot, just as I love nature and being there. Just like the bird I have from day one been near nature and spent quite a lot of time in it.”

**Post-Drawing:**
“The drawing portrays a Caucasian grouse in a relatively natural environment. It’s a bird and a destination I’d really like to see. It can be tied to that when I want to travel, I think about and pick destinations based on the nature experiences they can offer. If you look for symbolism in the piece, the mountain peaks can be likened to nature. There’s so incredibly much. But like the grouse sitting on its mountain, one has to remember to see the nature in one’s surroundings as well. In spite of all, that’s why you can live there.”

Erik’s pre-drawing depicts him as a common goldeneye looking out over the ocean, which he describes symbolises his love for the ocean and nature as well as being there, that he has always been near nature and has spent quite a lot of time in it. This seems to portray a much deeper sense of nature connectedness than what Erik’s pre-NR-21 score showed. The interview with him and the reflection he wrote gives some glimpses on how important nature is to him, but it seems the drawing really added a new dimension to this. Erik’s drawing and the accompanying written explanation shows a deeper connection to nature than the previously analysed pre-intervention material although still being in line with the information previously received on that Erik spends a lot of time in nature, which was also seen in the pre-interview and the pre-reflection.
Erik’s post-intervention drawing is of a Caucasian grouse in a mountain landscape, a place and a bird he would like to travel to see. He goes on to describe that nature experiences are the most important for him when choosing a travel destination, while emphasising that one should also appreciate nearby nature, and remember that it is the reason that one can live there. This shows a deep appreciation for all kinds of nature as well as an understanding of that nature is the precondition for human life, indicating a rather strong nature connectedness. Erik’s post-intervention drawing is very different from his pre-motive and writing so it is difficult to interpret if there is any changes in his nature connectedness from it. His NR-21 score did increase, pre: 3.48, post: 3.67; and there is nothing in the drawing or accompanying writing that goes against this.

**IG Participant 25 with Average IG Pre-NR-21 score, David, Pre 3.48, Post 3.9**

Pre-Drawing: “This shows all the places I like the most in nature!”

Post-Drawing: “IG participant 25 with average score on the pre-NR-21 among the IG participants 3.48, David. “I love nature and my jet ski. #Longingforsummer #Jetski 😊”

David explained that in his pre-drawing he drew all the places he liked the most in nature, which included skiing in a ski slope, mountains, water, a boat from which he was water skiing, a lighthouse, trees, grass berry bushes and mushrooms that he was picking berries and mushrooms from. This drawing matches very well with David’s pre-NR-21 score, showing he likes to spend time in nature, which was also visible in the pre-interview and his pre-reflective text where he described enjoying these activities in nature.

David’s post-intervention drawing was of a different but similar motive, he once again drew an activity that he likes to do in nature. His writing however, expressed a stronger nature connectedness by emphasising that he loves nature. Therefore, David’s post-intervention drawing can be seen to match with his increased NR-21 score, pre: 3.48, post: 3.90

**IG Participant 20 with Average IG Pre-NR-21 score, William, Pre 3.48, Post 3.71**

Pre-Drawing: “With this drawing I wanted to show how I train by for example cycling but at the same time can relax a little by the fire.”

Post-Drawing: “What I want to show with the drawing is that I think that it’s peaceful in nature. When I’m out in nature I feel peaceful and calm.”
William described, for his pre-drawing, that he wanted to show how he trains in nature, but also that he can relax by a fire. He drew a scenery of mountains, a lake, green ground, trees, a trail, and a shining sun; he also drew his bicycle and himself standing by a fire. This seems to match well with William’s pre-NR-21 score and the analysed pre-intervention material where he describes enjoying training in nature.

William’s post-intervention drawing is of a similar motive to his pre-drawing although it’s got a bit more detail. It is once again a mountain scenery with trees, a sun, himself, and a fire, but instead of a lake, there is a river and there is no trail or bicycle and the trees are more natural-looking and detailed. Instead of writing about the activities he does in nature, he described that nature is a peaceful place that makes him feel calm and peaceful, indicating an increased closeness to nature. This matches well with William’s increased NR-21 score, pre: 3.48, post: 3.71.

CG Participant 1 with Average CG Pre-NR-21 score, Elsa, Pre 3.48, Post 3.62

Pre-Drawing: “I drew a tree that a person hugs because there’s a picture of me as a child when I was hugging a tree. The plan was to incorporate all the parts of nature that I spend time in, forest, sunset by the cottage and a mountain, but I forgot to draw the mountain. I wanted to reflect harmony.”

Post-Drawing: “The last time I drew I forgot the mountain so I drew that in now since it’s an important part. I have relatives that are Sami and we commonly spend a lot of time among their reindeers so I drew in a reindeer as well.”

Elsa’s pre-drawing was of a sunset over a lake, with two swans joining beaks, green grass and herself hugging a tree; which she clarified was since there was a picture of her as a child hugging a tree. She explained that she wanted to include all the parts of nature that she spends time in, that it was a sunset by one of their cottages, and that she planned to include a mountain but that she forgot to; and that the overall idea was to reflect harmony. This seems to match well with Elsa’s pre-NR-21 score, although seeming to show an even deeper sense of nature connectedness and importance of nature, which also came through somewhat stronger in the interview and her reflection.

Elsa’s post-intervention drawing shows one of the family’s cottages, the mountain that she forgot to draw in the first drawing and a reindeer. Elsa explains that this drawing complements her first drawing that showed the sunset by the cabin, by now showing the cabin, the mountain that she forgot to draw, and a reindeer since she has Sami relatives whose reindeer she and her family spend a lot of time with. Just as Elsa describes it herself, this drawing; although with a different motive and less colourful than the first since depicting a winter scenery; can be seen to complement her first drawing and therefore show the same kind of nature connectedness. Elsa thought of the two drawings as complimentary and showing different parts of the view of one of her favourite places, which can be
interpreted as her nature connectedness remaining the same. However, some interesting new information was received from her drawing; Elsa did not mention in the interview nor in the reflection that she had Sami relatives; although she had mentioned spending a lot of time in cabins in the mountains which was an indication of that this could be the case. Although merely describing this as having Sami relatives and not describing herself as Sami, this connection is something she shares with IG participant Freja that describes herself as Sami. Elsa’s post-NR-21 score was slightly higher, from 3.48 to 3.62, indicating a slightly higher degree of nature connectedness which matches slightly better with her drawings and the information received from the pre-interview and pre-reflection. In Elsa’s post-interview, and in her post-reflection, she said she had not changed in any way from her pre-interview and pre-reflection. Perhaps she was more thorough answering the post-NR-21. It’s possible that participating in the study; engaging with her nature connectedness in all these ways which also indirectly stimulates biophilic values, unconsciously slightly increased her nature connectedness (which could also be the case for the other post-NR-21 increases in the IG participants that did drawings, reflections and interviews). This could explain for the slight increase in Elsa’s post-NR-21 score, but it was also so slight that Elsa’s comment on not having changed also could be correct.

**CG Participant 31 with Average CG Pre-NR-21 score, Evelina, Pre 3.48, Post 3.00**

![Pre-Drawing: “The coloured part of the tree describes my sense of connectedness to nature (almost half).”](image)

![Post-Drawing: “I grew up in the forest and I like nature no matter what season it is. I don’t feel that much connectedness with nature except for when I’m training. I train all year round and that’s why I like nature all year around.”](image)

Evelina’s pre-drawing was of a tree that was coloured in almost in half, Evelina described that this represented her sense of nature connectedness which she describes as being almost half. This definitely matches well with Evelina’s pre-NR-21 score and the previously analysed pre-intervention material where she expressed similar views on having been more connected to nature in her childhood.

Evelina’s post-intervention drawing was very similar to her first drawing except instead of leaving one half of the tree uncoloured, she used brown colours to depict it as wilted and put the flowers in the healthy part of the tree instead of on the ground. Hence, basically the same motive, just a little differently illustrated. During the post-interview, Evelina expressed that her nature connectedness had not changed, only her awareness of that it was lower now since she did not spend as much time in nature as when living with her parents in the place where she grew up. She thinks participating in the study made her more aware of this, resulting in a lower post-score. This could explain Evelina’s, however slightly but still, lower post-NR-21 score; from 3.43 to 3.00.
CG 9 Participant with Average CG Pre-NR-21 score, Tilde, Pre 3.43, Post 3.62

Tilde’s pre-drawing was of her father sitting by a fire, by a cabin in the woods while out hunting moose. Tilde did not draw herself in the picture but perhaps was thinking of herself as the observer and drawing a familiar view to her. The drawing contains quite a few details and seems to match well with the information received from Tilde’s written pre-reflection where she describes spending quite a lot of time in nature, however adding some new information on that her family spends time by a cabin. The drawing seems compatible with her pre-NR-21 score.

Tilde’s post-intervention drawing shows her and a family member by a river near the cottage that she drew in the first picture. Tilde clarifies that this is a place where she and her family usually fish, and that it is where she usually spends her time when she and her family is by the cabin that she drew in the first picture. Tilde explains that the cottage is her closeness or her part in nature. Thus, just as Elsa, Tilde choose to draw complementary pictures; trying to give a more complete view of the place that she thinks represents her closeness to nature; which once again can be interpreted as that her nature connectedness remains the same. This is also compatible with Tilde’s post-NR-21 score of 3.62, which is only slightly higher than her pre-NR-21 of 3.43; and her post-reflection saying that nothing had changed since the previous time of measurement.

IG Participant 8 with one of the Lowest IG Pre-NR-21 scores, Emma, Pre 2.67, Post 2.67

Emma’s pre-drawing was of a mountain with trees, a lake and a sun. She clarified that the distance between the trees (standing fairly close together) symbolised the closeness that she feels to
the place in the picture; where she used to spend a lot of time when she was younger; as well as to forests in general. That Emma did not draw herself in nature, doing an activity is compatible with the information from her interview and reflective text where she described not spending that much time in nature. She describes the place in the picture as somewhere she used to spend a lot of time when she was younger, also indicating she does not spend that much time in nature now. The drawing could therefore be interpreted to match well with Emma’s pre-NR-21 score as well as the interview and her written reflection while at the same time providing greater insight to what type of place in nature she feels close to and that she feels rather close to forests in general.

Emma’s post-intervention drawing was similar to her pre-drawing, it was of a sunset over a mountain lake. This time, the distance between the sky and the water was to indicate her closeness to nature. There was no real sign of any increased nature connectedness in either the drawing or the writing and this matched well with her NR-21 score remaining the same; pre: 2.67, post: 2.67.

**IG Participant 5 with one of the Lowest IG Pre-NR-21 scores, Erika, Pre 2.67, Post 3.19**

Erika’s pre-drawing is of a waterfall, she explains that this is the first thing that came to her mind. This seems compatible with the information in the interview where one of the things she mentioned was that her family would sometimes go look at waterfalls. It seems indicative of her low pre-NR-21 score that she did not draw herself into the picture, that her experience is more of occasionally going to look at nature, in this case in the form of a waterfall. Further confirming this is that there is not really a lot of detail in the drawing. This also matches well with the information from the interview and Erika’s reflective text, that she has a low connectedness to nature. …

Erika’s post-intervention drawing is of her grandparent’s pond and house, where she spent a lot of time swimming, which she has enjoyed. This time, she has a motive of doing an activity in nature instead of just looking at it and she expresses that she enjoys this activity in nature. This could indicate an increased nature connectedness, which is seen in her NR-21, pre: 2.67, post: 3.19.

**IG Participant 2 with the Third Lowest IG Pre-NR-21 score, Alfred, 2.86 (2.90)**
Alfred’s pre-drawing was of a text spelling nature in different colours, he clarified that it represented the many colours and differences in nature. He was the only one that did not draw any objects in his picture, thus not including himself in the picture either. This could be indicative of a lower sense of nature connectedness although his explanation of wanting to symbolise nature’s colours and differences could be indicative of connectedness to nature; that he is aware of and thinks of this. Alfred’s reflection also indicates a low nature connectedness so the drawing can be interpreted to be compatible with this and his pre-NR-21 score.

Alfred’s post-intervention drawing was very different from his pre-drawing, this time he drew a campfire in the forest, explaining it is a nice barbeque evening with friends. Since the pre-drawing was more abstract, it is very difficult to compare the two. However, his NR-21 indicates that his nature connectedness is unchanged, the score was almost the same, pre: 2.86, post: 2.90.

**CG Participant 26 with the Lowest CG Pre-NR-21 score, Karl, Pre 2.24, Post 2.43**

Karl’s pre-drawing was with a few trees and a sun where he was doing downhill skiing in a ski slope, which he explained represented his relation to nature, that he concluded consisted of downhill skiing. This is very similar to what Karl described in both the interview and the reflection and matches well with his low pre-NR-21 score. It seems that nature’s meaning and function to Karl nowadays is solely connected to his downhill skiing, which is mostly performed in environments with few natural elements.

Karl’s post-intervention drawing was very similar to his first drawing, but missing the few trees and the sun that was in the first drawing, making nature even more of a backdrop. He clarified that it showed him skiing a slalom competition. In Karl’s post-interview and post-reflection, he said that nothing had changed since last time. His post-NR-21 score was slightly higher; from 2.24 to 2.43; which could be a result of participating in the interview, writing the reflective text and thereby thinking back of childhood memories in nature, indirectly activating biophilic values. The post-score is however still low and therefore similar to his pre-NR-21, and the drawing paired with the post-interview and post-reflection strengthens that his nature connectedness remains the same; low.

**CG Participant 15 with the Second Lowest CG Pre-NR-21 score, Anna, Pre 2.67, Post 2.76**
Anna’s pre-drawing was of a stick figure, a thumbs up and a tree; which she clarified showed that she had a relatively good relation to nature. There is no details of nature in the drawing and Anna is not doing any activity, which could be interpreted as matching well with her low pre-NR-21 score that indicated a rather low connectedness to nature. This is also compatible with Anna’s interview and her written reflection, where it is clear that she only spends time in nature if there is an organised outdoors school activity.

Anna’s post-intervention drawing is similar to the first drawing but this time only consisting of a smiley face and a tree; which she explains symbolises her medium connection to nature. This could be interpreted as an unchanged nature connectedness since it is very similar to her first drawing. Anna’s post-NR-21 is slightly higher, going from 2.67 to 2.76. The post-interview and her post-reflective text confirm what can be interpreted from the post-drawing; that she feels the same as before. Hence, it seems Anna’s nature connectedness is mostly unchanged and remains low.

**CG Participant 18 with the Third Lowest CG Pre-NR-21 score, Anders, Pre 2.81, Post 3.24**

Anders’s pre-drawing is of him holding a carrot outside a house in the countryside, surrounded by fields, a lake, and a vegetable garden. Anders comments that he likes nature, the countryside, animals and growing his own food. This shows a rather good connection with nature, although he pictured cultivated nature and not for example a forest or mountains; to him nature appears to be more his everyday countryside village environment. This matches well with what Anders described in his reflection but could indicate a higher degree of nature connectedness than in his pre-NR-21 score, although it could be that he thinks mostly of nature as in how it is useful to humans; since cultivated nature is what he drew; and less of nature’s, animals’, and plants’ intrinsic value; which is somewhat indicated in his reflective text.

Anders’s post-intervention drawing is also of a more countryside, cultivated type of nature that is similar in this way to his first drawing, but with a different motive. The post-drawing shows him in a swing, surrounded by apple trees, with a dog sitting on a small hill and birds flying around in the sky. His comment is that it makes him happy and calm to be in nature, listening to birds and the wind in the trees. This shows that he listens to the sounds in nature and that it affects his feelings positively, indicating quite a good sense of nature connectedness; just as in his first drawing. Anders writes in his post-reflection that nothing has changed since the previous time. Anders post-NR-21 is however slightly higher, going from 2.81 to 3.24; which seems to match better with both his drawings and his pre- and post-reflection. It appears more likely that Anders pre-NR-21 score was less indicative of his nature connectedness than that his nature connectedness actually changed, since both his reflective texts and his drawings indicate an unchanged and rather high nature connectedness; more compatible with his post-NR-21 score. At the time of the pre-questionnaire, Anders was one of the first to finish, which could indicate that he rushed through the questionnaire. His written reflection also contained a lot of misspellings, indicating trouble with reading and writing, which could lead to misinterpretations. It is unclear whether his nature connectedness increased or remained unchanged.
5.4 Observations During the Intervention

During the activities to activate biophilic values with the IG, some interesting observations were recorded in the research diary. In the beginning of the project, it was interesting to note that several of the students showed appreciation and interest towards the plants and the fountain that were installed in the classroom, some started touching these and several made remarks on liking the plants. After a lesson when listening to bird song, one student approached me afterwards and said that she wished that these sounds were played everywhere and all the time since they were so relaxing. Before the planting of seeds, I was a bit worried that the upper secondary students would think of this as childish, but several of the students showed great excitement. During the activity where students were to make a photo collage on the theme ‘nature’s beauty’, one student was talking to another:

Student A: “Could I really use this, it’s just a picture of me and a dog, does that count as nature?”
Student B: “Well, the dog’s nature so why not?”
Student A: “Well I’m nature too.”

This was interesting because that is exactly what I hoped for, that the student’s would realise that they are part of nature too. I was also amazed to see how beautiful their photo collages turned out, some of the students spent a lot of time going through their own pictures, some browsed the internet, and some used a combination. Another conversation between students during the making of the photo collages concerned why nature is being harmed and sustainability issues:

Student A: “Nature is so damn beautiful I don’t understand why people have to destroy it.”
Student B: “To be able to buy cheap clothes.”

A discussion followed on the importance of trying to buy environmentally friendly products, which led one student to mention; “But you have to think about that everything that’s environmentally friendly might not be the most financially smart.”; to which another student replied, “But often really, that’s what it is.”, which was supported by several other students. It was interesting to see that they made this connection between why nature is being harmed and how one can contribute to protecting it; as well as their differing opinions on whether this was in line with economic gains or not.

During the ‘Act for Nature’ activity where students worked in groups to take action to increase sustainability, a pair of students decided they would test footprint calculators to be able to do a teaching segment for the other students where they calculated their footprints to become aware of their impact and were given advice on how to decrease their footprint (both individual actions and how to influence society). As one of the students tested the footprint calculator, she was shocked to see the results: “So if everyone lived like me the earth’s resources would be finished by March 10?! Oh my god … Oh my god, this really isn’t good.” It was also interesting to see that all the students got really excited about the ‘Act for Nature’ assignment and got to work right away. Only one student said he didn’t really care that much about nature or sustainability. Some other activities that students did for the ‘Act for Nature’ assignment was picking up trash, recycling, spreading seeds of wildflowers, contacting local politicians asking for the school to have recycling bins instead of just one trash can, trying to live more sustainably, making posters, donating to environmental organisations, and having a completely vegetarian week and sharing the recipes and photos on Instagram.

When doing the activities outdoors, the weather was rather cold and there was still quite a bit of snow, but students took part and seemed to enjoy being outdoors. After a while, when they had the opportunity to move around freely, they explored the edge of the ice and one of them climbed a tree.

Overall, the participating students seemed to enjoy the activities during the intervention.
6. Discussion

I investigated the effects of activating the five biophilic values, during social science education, on increasing upper secondary students’ nature connectedness and thereby their PEAB. Since previous research had shown that the five biophilic values (emotion, contact, beauty, meaning, compassion) were strong pathways to nature connectedness in adults (Lumber, 2016; Lumber et al., 2017); and that nature connectedness strongly correlated with PEAB (DeVille et al., 2021); and since the goal of ESD is to increase sustainability; the study aimed at answering the two research questions and associated hypotheses:

(1) How does an intervention aimed at activating biophilic values affect upper secondary students’ nature connectedness?

The following two hypotheses were posed:

Null hypothesis (H₀): Students participating in the intervention aimed at activating biophilic values will not increase their nature connectedness more than the control group.

Alternative hypothesis (H₁): Students participating in the intervention aimed at activating biophilic values will increase their nature connectedness more than the control group.

(2) How does an intervention aimed at activating biophilic values affect upper secondary students’ pro-environmental attitudes and behaviours?

Null hypothesis (H₀): Students participating in the intervention aimed at activating biophilic values will not increase their pro-environmental attitudes and behaviours more than the control group.

Alternative hypothesis (H₁): Students participating in the intervention aimed at activating biophilic values will increase their pro-environmental attitudes and behaviours more than the control group.

The hypotheses associated with RQ1 were tested by conducting a quasi-experimental pretest-posttest nonequivalent comparison static groups design. Hence, pre-test and post-test results and material of the IG (n=32) and a CG (n=32), were compared on the NR-21 scale, CNS, INS; as well as interviews with six IG participants and six CG participants; reflective texts of nine IG participants and nine CG participants; as well as drawings of nine IG participants and nine CG participants. A series of t-tests were performed on the pretest and posttest results of the IG and the CG on the NR-21, CNS, and INS. The interviews, reflective texts, and drawings were qualitatively analysed to find changes in nature connectedness. The first hypothesis was rejected. The second hypothesis was not rejected since the participants in the IG increased their scores in the post-tests of the NR-21, CNS, and INS significantly more than the CG participants (NR-21 IG increased by .41, compared to CG .02 (p = .001, r = .78); CNS IG increased by .51 compared to CG .03 (p = .008, r = .34); INS IG increased by .71 compared to CG .00 (p = .017, r = .86) as well as the IG showing an overall increase in their nature connectedness in their interviews, reflective texts and to some extent in drawings; which was not seen in the CG.

As for the second research question and accompanying hypotheses, these were tested by comparing pre-test and post-test results and material of the IG (n=32) and CG (n=32), on a PEAB scale; as well as interviews with six IG participants and six CG participants; reflective texts of nine IG participants and nine CG participants. A t-test was performed on the pretest and posttest results of the IG and the CG on the PEAB scale. The first hypothesis was rejected. The second hypothesis was not rejected since the participants in the IG increased their score on the post-PEAB significantly more than the CG participants (by .51 compared to .00) (p = .000, r = .66) as well as the IG showing an overall increase in PEAB in their interviews and reflective texts; which was not seen in the CG.
Interestingly, the students seemed to enjoy participating in the activities during the intervention and showed signs of increased nature connectedness and PEAB in their discussions.

6.1 Interpretation of Results

Regarding RQ1 and its second hypothesis, centring on increasing the nature connectedness of the IG more than the CG by activating biophilic values, there was a significantly higher increase in the post-NR-21, CNS and INS score of the IG compared to the CG. The same was seen in the other collected material, in the interviews, reflective texts, and to some extent in drawings; the IG as a whole showed an increased nature connectedness, while the CG showed an unchanged degree of nature connectedness.

The changes in the degree of connectedness to nature was easier to measure and compare using the quantitative scales than the qualitative and arts-based material. However, the qualitative and arts-based material provided interesting complementary information on the participants relationship to nature and nature connectedness and mostly supported the findings from the scales.

As for RQ2 and its second hypothesis, PEAB was also seen to increase more in the IG posttest than the CG posttest. Which was also confirmed by the interviews and reflective texts.

Overall, it was promising that the students seemed to enjoy taking part in the activities during the intervention and that their discussions showed signs of increased nature connectedness and PEAB. I as a teacher also appreciated the mixing of theory and practice, as well as spending more time outdoors in nature. I relished the student’s eagerness and creativity during the ‘Act for Nature’ assignment where they took the chance to practice and act what they had learnt. Further, it was interesting that the participants with high nature connectedness, high pre-NR-21, had in common that they had spent a lot of time in nature when growing up; and that the ones who spent time in nature together with their family, continued to spend time in nature. For them, nature was connected with socialising, joy, and relaxation. These high pre-NR-21 participants also showed a much higher degree of nature connectedness in their drawings than the participants with lower pre-NR-21; often portraying themselves in nature, doing an activity they enjoyed, and reproducing nature in a detailed way.

6.2 Implications

The results of this interventional study provide useful insights and contributions to the field of ESD by investigating how education can contribute to increase students’ nature connectedness and PEAB. The results of this study suggest that combining sustainability learning with activating the five biophilic values of contact, emotion, beauty, meaning and compassion; can have a positive effect on students’ nature connectedness and PEAB; thereby contributing to existing literature on the five biophilic values as pathways to nature connectedness. The five biophilic values can be further tested, implemented, and evaluated in education to increase nature connectedness and PEAB.

The current models for education in Westernised nations tend to be rigid and standardised, leaving less room for creativity and outdoor exploration (Hursh, 2005). This study can support a focus beyond the indoor classroom and merely knowledge-based activities, in order to achieve increased nature connectedness and PEAB in students. As advocated by Lumber (2016), Mikael (2019), Wolff and Sjöblom (2016), students should be given an opportunity to truly get close to the rest of nature and to challenge anthropocentric worldviews that nature only exists for humans. Further, aesthetical dimensions of learning and meaning making should be natural parts of learning, as both Wolff and Sjöblom (2016) and Nyberg et al. (2019) argue.
6.3 Delimitations and Limitations

Since the sampling group was small and of convenience, the idea was not to achieve general
generalizability, but to, by combining several different methods, get as detailed and varied a view of
the participants' nature connectedness and how it was affected by the intervention (aimed at activating
the five biophilic values) as possible. This was to get an indication of the effectiveness of the
intervention on increasing nature connectedness in participating students. Another limitation
centering the participants, was that the majority were female students, making it impossible to know
if the results could be applicable to male students. Still, the study gives an indication on the
effectiveness of the intervention, although further studies are needed to confirm generalizability.

Mapping nature connectedness and measuring the degree of nature connectedness is difficult
since it is complex and individual, still, the developed measuring scales that have been thoroughly
developed and tested should be well suited to detect changes in the degree of nature connectedness in
individuals on a group level. The results from the interviews and reflective texts also strengthened this.
However, it is difficult to know exactly what is possible to know and map about an individual’s nature
connectedness. The use of drawings could be more effective to measure differences between
individuals than changes in an individual’s nature connectedness, at least for short time periods.

It needs to be recognised that internal validity was threatened by the possibility of data
collector bias since the collector was aware of the intent of the study (Fraenkel et al., 2019:535-536),
care was taken not to overlook responses or results no matter what they indicated; and not to distort
results during implementation, or collection of data. The use of a CG mitigates threats of maturation,
regression and effects of cyclical changes (including seasonality, as in this case how the test-results
could vary from being conducted in winter (pretest) to spring (posttest)); as groups will be as similar
in characteristics as possible; results still need to be interpreted carefully, internal validity was
weakened by that; characteristics were not exactly equal and since participants were not randomly
assigned to groups; however, the difference between IG and CG in pre-test scores was insignificant
except for CNS scores. Another reason to interpret results carefully is that all methods are based on
self-report, which could involve unconscious or conscious inaccuracies (Rosenman et al., 2011). For
example, the attitudes of participants might be influenced by the Hawthorne effect (unconscious
change in behaviour due to being in an experiment) and or feelings of that they are supposed to show
improvement since part of a study (Fraenkel et al., 2019:168-170). Moreover, it should be taken into
consideration that according to the Heisenberg uncertainty principle, merely observing or measuring
human behaviour can change it (Reichardt, 2019:103). Additionally, the psychometric scales are
subjective which leaves room for interpretation of questions and response alternatives; however, they
should still be reliable to measure changes in the same participant, that should interpret the scale
similarly in the pretest and posttest. I am aware that the small-scale quasi-experimental non-equivalent
static groups design makes for a weaker external validity; pedagogical recommendations cannot be
made based on findings from a single classroom; however, results can serve as a basis for further
studies and thereby be part of improving education, and the study did have a direct impact on the
teacher and IG students involved, increasing the student’s nature connectedness and their PEAB.

A limitation was the time of year that the intervention was carried out and the short duration;
in order to finish the thesis on time, the intervention had to be carried out while there was still quite a
lot of snow on the ground, making it more difficult to carry out the activities to activate the biophilic
values (for example when using the senses, there is not as many scents to smell and not any flowers or
as much greenery to look at or touch as during spring and summer) and resulting in less time being
spent outdoors than originally planned (due to cold temperatures and a short duration).
6.4 Recommendations for Future Research

Further research is needed on how effective the individual parts of the educational intervention are and on educational interventions using the biophilic values as a framework at all different ages in the educational system. It would be particularly interesting to investigate the effects of activating the five biophilic values in younger children, at pre-school level and elementary school. At pre-school level, where there is less focus on learning different subjects, there would be greater room for applying the biophilic values activation on daily outdoors activities. Additionally, some research suggests that a person’s nature connectedness is more easily affected at younger ages (Wells & Lekies, 2006; Beery, 2013). Future research in ESD should continue to focus on how students’, of all ages, nature connectedness and PEAB can be affected since this is vital in achieving sustainability. People need to want to act sustainably and to act sustainably (both in their everyday life and at a societal level) in order for sustainability to be achieved. Therefore, it is necessary to do more research on what role activation of biophilic values can play in this, since this thesis and previous research has shown that this can be a pathway to nature connectedness and increased PEAB. Since the goal of ESD is to achieve sustainability, activating the biophilic values and other ways to increase nature connectedness and PEAB need to be further researched.

Additional research is also needed on ways to motivate students of all ages to more frequent and regular contact with nature, both during the school day and outside of the school day.

6.5 Conclusions

The intervention activating the five biophilic values (emotion, contact, beauty, meaning, compassion) was successful in significantly increasing the nature connectedness and PEAB of the IG while the nature connectedness and PEAB of the CG did not increase significantly. The IG showed an overall increase in nature connectedness and PEAB in all the collected post-material, the means of the NR-21, CNS, INS and PEAB, post-interviews, post-reflections, and to some extent in post-drawings. The control group on the other hand did not show a significant increase in their post-material, only a slight and insignificant increase on the scales and no increase in nature connectedness or PEAB in the post-interviews, post-reflections, or post-drawings. The NR-21 mean of the IG increased by 0.41, compared to the CG 0.02 (p = .001); the CNS mean of the IG increased by 0.51 compared to CG 0.03 (p = .008); the INS mean of the IG increased by 0.71 compared to CG 0.00 (p = .017), and the PEAB mean of the IG increased by 0.51 compared to the CG 0.00 (p=.000).

It was interesting to see that the students seemed to enjoy participating in the activities during the intervention and that they showed signs of increased nature connectedness as well as PEAB in their discussions and choices of ‘Act for Nature’ activities. For example, discussions showing an awareness that humans are part of nature, discussions showing an awareness of the negative impacts that humans have on nature and that this needs to change, and actions on both an individual and structural level to increase environmental sustainability.

It is recommended that further ESD research should be done in the area and that the findings should be both further tested and implemented and evaluated in ESD practice on all educational levels. In ESD practice and in education in general, it is crucial to increase students’ PEAB, since attitudes and action will be determinant in realising a sustainable future. Increasing students’ nature connectedness by activating biophilic values can play an important part in increasing their PEAB and thereby in achieving sustainability. That students get close to the rest of nature and realise its intrinsic value, is also important to counter anthropocentric views of nature merely existing for the sake of humans and to instead counter this with perspectives of posthumanism and inclusive pluralism.
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Appendix A

Nature Relatedness Scale (NR-21)

From Nisbet et al. (2009).

Instructions: For each of the following, please rate the extent to which you agree with each statement, using the scale from 1 to 5 as shown below. Please respond as you really feel, rather than how you think “most people” feel in the box provided.

1 2 3 4 5
Strongly disagree Neutral Strongly agree

1. I enjoy being outdoors, even in unpleasant weather
2. Some species are just meant to die out or become extinct
3. Humans have the right to use natural resources any way we want
4. My ideal vacation spot would be in a remote, wilderness area
5. I always think about how my actions affect the environment
6. I enjoy digging in the earth and getting dirt on my hands
7. My connection to nature and the environment is a part of my spirituality
8. I am very aware of environmental issues
9. I take notice of wildlife wherever I am
10. I don’t often go out in nature
11. Nothing I do will change problems in other places on the planet
12. I am not separate from nature, but a part of nature
13. The thought of being in the woods away from civilisation is frightening
14. My feelings about nature do not affect how I live my life
15. Animals, birds and plants should have fewer rights than humans
16. Even in the middle of a city I notice nature around me
17. My relationship to nature is an important part of who I am
18. Conservation is unnecessary because nature is strong enough to recover from any human impact
19. The state of non-human species is an indicator of the future for humans
20. I think a lot about the suffering of animals
21. I feel very connected to all living things and the earth
Appendix B
Connectedness to Nature Scale (CNS)

From Mayer & Frantz (2004:513)

Instructions: Please answer each of these questions in terms of the way you generally feel. There are no right or wrong answers. Simply state as honestly and candidly as you can what you are presently experiencing.


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

Inclusion of Nature in Self scale (INS)


Instructions:

“Please circle the picture below which best describes your relationship with the natural environment. How interconnected are you with nature?”
Appendix D

Scale on PEAB

Questions measuring PEAB from Richardson et al. (2020b) with slight adaptations.

PEA

1. How would you feel if these animals no longer existed?
   1 = ‘Very happy’ to 5 = ‘Very unhappy’

2. Ensuring people have jobs in Sweden today is more important than protecting nature and wildlife for the future.
   1 = ‘Strongly disagree’ to 5 = ‘Strongly agree’

3. It is important that there are strong laws to protect nature in Sweden.
   1 = ‘Strongly disagree’ to 5 = ‘Strongly agree’

4. I feel more comfortable in the city than in the countryside.
   1 = ‘Strongly disagree’ to 5 = ‘Strongly agree’

5. I’m concerned about the decline of wildlife in Sweden.
   1 = ‘Strongly disagree’ to 5 = ‘Strongly agree’

PEB

1. I have reduced the amount of meat that I eat.
   1 = ‘I have not done this’ to 5 = ‘I have done this to a large extent’

2. I have chosen to buy local food based on food miles.
   1 = ‘I have not done this’ to 5 = ‘I have done this to a large extent’

3. I have reduced my consumption of stuff.*
   1 = ‘I have not done this’ to 5 = ‘I have done this to a large extent’

*This question was added in place of ‘I have reduced the number of flights that I take’, which was deemed irrelevant for upper secondary students.
Appendix E

Interview Questions

Before the intervention
1. Age
2. Place of stay
3. Place where you grew up
4. What do you think about when you think about nature?
5. What does the concept nature mean to you?
6. If you spend time in nature (as in green areas, water, the non-built environment), how often and how much time do you spend in nature?
7. If you compare the amount of time that you spend in nature now with the amount of time you spend in nature in your childhood, is it the same or does it differ in any way?
8. Are you content with the amount of time you spend in nature? If not, what affects the amount of time you spend in nature?
9. Do you think there’s anyone that has influenced your relationship to nature?
10. If you spend time in nature, how do you spend your time there?
11. If you perform any activities in nature, what activities are that?
12. If you spend time in nature, how would you describe the different types of nature that you spend your time in?
13. How would you describe your relationship to nature?
14. Do you see yourself as a part of nature or as separate from nature?
15. What meaning does nature have for you?
16. How does being in nature make you feel?
17. If being in nature affects you, how does it affect you?
18. Do you have a place in nature that is meaningful to you, if so describe it and why it’s meaningful to you. Do you have a picture of it?
19. Have you experienced a meaningful event that took place in nature, if so describe it.
20. Are there any scents in nature that you appreciate? What makes them special?

After the intervention
The same questions are asked but for each question with the added start ‘Has anything changed since the first interview when it comes to…’.
Appendix F
Prompts for the Reflective Texts

Before the Intervention

Your relationship with nature and sustainability: In a short reflective text, describe your relationship to/with nature, how connected do you feel to nature, what does nature mean to you, and what activities do you perform in nature and how often? Also describe if and how you think about and/or act sustainably in everyday life and what actions you could consider doing in the future to increase sustainability in society (as a private person, as a citizen, in your work life, as a member of an organisation).


After the Intervention for the IG group (the CG got the same instruction as before)

Your relationship with nature and sustainability: In a short reflective text, focus on describing if there have been any changes since your last reflective text. Describe your relationship to/with nature, how connected do you feel to nature, what does nature mean to you, and what activities do you perform in nature and how often? Would you say that your relationship with nature has in any way changed during/after the educational segment on human-nature connectedness (describe further)? Also describe if and how you think about and/or act sustainably in everyday life and what actions you could consider doing in the future to increase sustainability in society (as a private person, as a citizen, in your work life, as a member of an organisation). Would you say that your thoughts about and/or actions for sustainability, and/or what you could consider doing to increase sustainability in the future, has changed in anyway (describe and elaborate)?

Swedish: Din relation med naturen och hållbarhet: I en kort reflekterande text, beskriv din relation till/naturen, vilken grad av samhörighet du känner med naturen, vad naturen betyder för dig och vilka aktiviteter du brukar utöva i naturen samt hur ofta. Skulle du säga att din relation till naturen på något vis har förändrats under utbildningsmomentet om människans samhörighet med naturen (beskriv och utveckla)? Beskriv också om och vad du tänker på kring hållbarhet i vardagen och vilka handlingar du skulle kunna tänka dig att göra i framtiden för att öka hållbarheten i samhället (som: privatperson, medborgare, i yrket, som medlem av en förening). Skulle du säga att dina tankar på och/eller agerande för hållbarhet, och/eller tänkta framtid agerande för hållbarhet, på något vis har förändrats under utbildningsmomentet om människans samhörighet med naturen (beskriv och utveckla)?
Appendix G

Instruction for the Drawings of Interconnectedness with Nature

The same instruction was used before and after the intervention:

Draw your relationship with nature, try to show the level of connectedness that you feel with nature in the drawing, what nature means to you and how you relate to it. On the back of the drawing: Write a short explanation of the drawing and your relationship and connectedness with nature.

Appendix H
Initial Canvas Plan of the Action Research Project

CONCLUSION
Since the project is more about improving teaching methods to increase nature connectedness in students and not about a specific community project, action research seems the most suitable form (instead of participatory action research).

ENSURING SUSTAINABLE CHANGE
If successful, I can seek to implement the methods (and/or adapted versions) not only in my own classes but among other teachers in the school, and in my role as a "First teacher" also in all the other schools in the municipality.

As for the individual participants, hopefully they are inspired to continue similar activities on their own.

PRACTICE TO IMPROVE
Teaching and learning to increase nature connectedness.

PROBLEM TO SOLVE
Upper secondary school students lack of nature connectedness (and thereby lack of pro-environmental attitudes and behaviours) and educations lack of offering opportunities to improve this (Cudworth & Lumber, 2021).

CORE TEAM
I would like to perform an educational intervention involving some of the upper secondary school students that I teach (probably second year, grade 11, age 16+).
Continuous discussion with a fellow ESD student, and my social science/sports colleague.

DATA TO BE COLLECTED
The established surveys to measure nature connectedness; the Nature Relatedness Scale and the Inclusion of Nature in Self scale would be administered before and after the intervention.

Also interviews, written reflections, and arts-based methods (drawings). These qualitative methods might be used on a limited number of participants.

THE ORGANISATIONS KEY CHALLENGES AND LIMITATIONS
The school days are organized into short lessons of around an hour (3 times/week), making it more difficult to have the time to go outdoors.

Many teachers are reluctant to give away time from their scheduled lessons.

THE ORGANISATIONS KEY OPPORTUNITIES AND STRENGTHS
The principal has a very benevolent, encouraging and appreciative attitude towards ESD and alternative methods in teaching.

As a teacher, I have access to groups of students and hopefully enough of them would volunteer to join the project.

FACTORS THAT CAN THREATEN THE PROJECT
I plan an excursion to a nearby forest and it would be preferable to do that after the snow has melted (April/early May), hopefully this is not too late. (The back-up plan is an intervention to increase awareness on how economic growth affects sustainability.)

If not enough students decide to participate.