

# **Enriching Children's Naturalistic Intelligence with Nature-Based Education: Positively Influencing the Minds of the Next Generation**

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## **Abstract**

Naturalistic Intelligence, first introduced by Howard Gardner in 1999 as a part of the multiple intelligences theory, refers to one's ability to understand and connect with their surrounding environment. This theory serves as a starting point to see whether people are able to adapt with their surroundings. This reveals that different social cues/socialization might influence people's naturalistic intelligence. In North America, not a lot of researchers explore the depth of the effects of nature-based education influencing children's concept of nature. Research has shown encouraging evidence on how nature-based education can increase students' naturalistic intelligence and stimulate their innate appreciation and awareness for environmental conservation. Nature-based education could be a feasible and promising solution to many deep-rooted sustainability issues faced currently, by fundamentally changing the mindset, values and behaviour of the next generations. The current paper examines naturalistic intelligence interventions, nature-based education and their positive impacts.

**Keywords:** Naturalistic Intelligence, children, nature-based, education

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## INTRODUCTION

Influential education professor Howard Gardner theorized a model of conceptualizing human intelligence into distinct modalities through multiple intelligence theory. In multiple intelligence theory Gardner proposed eight modalities of human intelligence that are developable throughout an individual's life (Gardner, 1999). Naturalistic intelligence is one of eight modalities that "refers to the ability to recognize and classify plants, minerals, and animals, including rocks and grass and all varieties of flora and fauna" (Gardner, 1999).<sup>1</sup> Individuals who rate high in naturalistic intelligence experience an in-tune connection with nature and one's natural environment and have an innate ability to make observations and distinctions about nature during childhood. Through development they continue to show lifelong interests in natural elements, like gardens, forests, and mountains, and possess an affinity for animals with a distinct ability to tame, care, and interact subtly. High rate of naturalistic intelligence often results in a calling to specific

pursuits, e.g. naturalists, weather forecasting, gardening, fishing, forestry, and civil engineering (Gardner, 1999). Gardner theorized that entire scientific fields have risen from the skills of naturalists like botany and entomology. Gardner related that these naturalists' skills possess indirect capabilities such as "recognizing automobiles from the sound of their engine, detecting novel patterns in a laboratory, or discerning artistic styles" (Gardner, 1999).

The current research has not addressed the effects of implementing nature-based curricula in and out of the classroom. This paper will explore the benefits of nature-based education in both a class setting and as an extracurricular program that positively enhances children's natural intelligence. The paper explores naturalistic intelligence interventions from past studies and the impact it has had in and outside of the classroom. The paper explores how nature-based education can influence students' naturalistic intelligence and how naturalistic intelligence is crucial in contributing to solving sustainability issues.

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<sup>1</sup> Gardner's multiple intelligence theory is not widely accepted within the psychological field due to lack of empirical evidence. We view it closer to the notion of an

aptitude or criterion to the phenomenon rather than a distinct intelligence "type".

## RESEARCH METHODS

The literature compilation was conducted through the University of Toronto Libraries database, the University of British Columbia Libraries database, and Google Scholar using keywords such as 'naturalistic intelligence interventions' and 'nature-based education'. Articles were selected based on their relatedness to either naturalistic intelligence, nature interventions, or provided relevant background information. The objective of the literature review is to identify potential interventions to affect different groups' naturalistic intelligence levels, thus findings regarding nature-based education's impact on other factors such as mental health, cognitive development were disregarded.

## FINDINGS

### *Naturalistic intelligence interventions*

Mauladin (2013) studied 60 children to examine the effects of two different learning methods of environmental knowledge on children's naturalistic intelligence. In the first group, children experienced a storytelling method that provided learning materials through stories, visual media,

and books. The second group, a hands-on method, provided children the opportunity to experience nature through gardening and foraging. Both experimental groups provided the children with scientific knowledge about different ecosystems and subsequently measured their ability to translate and apply the newly learned knowledge e.g. to assist in plant growth, understand the negative effects of pollution in ecosystems, and match different plants and animals they have observed to the corresponding ecosystem. Mauladin discovered that children in the hands-on learning group with above average levels of naturalistic intelligence performed better than those in the storytelling group. The children in the hands-on learning group with low levels of naturalistic intelligence did not perform well. A proposed explanation to the difference was the socioeconomic status amongst the children e.g. children who grew up in urban areas may have less exposure to nature than those in rural areas. This may explain why some children adapt quicker than others. Mauladin concluded that consistent exposure to nature will enable children to enhance their naturalistic intelligence.

Kurniawati & Adiarti (2017) tested the impact of outdoor activities on improving young children's naturalistic intelligence. The research studied 30 children, aged 5 to 6 years old, and measured their naturalistic intelligence levels before and after the intervention, where children were guided on a tour to a local biodiversity centre to learn about biodiversity and develop connections to nature. The research concluded that naturalistic intelligence can be trained or fostered by structured outdoor activities. By being in nature, children can nurture their love and care for the environment from a young age.

Otto & Pensini (2017) conducted research on 255 German 4<sup>th</sup> – 6<sup>th</sup> graders to evaluate the role of nature-based environmental education on ecological behaviours. The research showed a positive relationship between participation in nature-based education and ecological behaviours, demonstrated by greater connectedness to nature (69% variance explained in the change of behaviour) and environmental knowledge (2% variance explained in the change of behaviour). In this research, the competence model of environmental education was examined, which

stated that ecological behaviour was stimulated by developing intrinsic motivation of feeling connected to nature and acquiring environmental knowledge. This study pioneered examining the importance of environmental education in solving sustainability issues. It referred to this education as an “indispensable requirement” to promote sustainable development in the next generations. Similar research was done in Indonesia on junior high school students using comparative studies (Adisendjaja et al., 2019), group A went on a field trip as the primary learning method, an activity-based learning approach for students to get first-hand learning experiences, and group B used class discussion to learn about environmental knowledge. The result showed that the field trip positively impacted the students' naturalistic intelligence. The authors suggested field trips as an alternative teaching method in junior high schools to not only improve students' naturalistic intelligence but also an appreciation for learning ecosystem subjects.

Finally, Hayes (2009) considered the effect of outdoor curriculum on undergraduate students' naturalistic intelligence. He invited biologists and expert naturalists to connect with students. He

instructed them to write conservation autobiographies on a field trip. The study found that students' naturalistic intelligence was increased by the presence of experts and scientists as well as the outdoor-based assignments or projects. The approach allowed students to observe and learn in nature from their own point of view while developing specialized knowledge that aids and motivates their future academic pursuit in conservation biology.

### *Impact of nature-based education*

The implementation of a naturalistic intelligence intervention has been shown to be effective in students' participation in cooperative methods in schooling (Quirantes, 2020). Cooperative methods of learning may favour the skills associated with naturalistic intelligence such as being able to interact with others and the environment. By utilizing the skills encompassed in naturalistic learning, students may be able to foster stronger development of cognitive abilities in analysis and recognition of various patterns around, classification and categorization, as well as the capacity to make complex analyses (Quirantes, 2020).

Kasirahan's (2016) study emphasized the connection between students with an affinity for naturalistic intelligence and academic achievement in related classes such as biology. Academic disciplines such as biology are concerned with phenomena of the natural world and may thus allow for individuals with a stronger affinity for naturalistic abilities to succeed. The results of the study suggest individuals with a stronger sensitivity to the natural environment may display more qualities that align with the properties important to understanding academic disciplines involving different natural environments. In this way, naturalistic intelligence may be used as an intervention in classes to promote the skills and abilities of students with an innate inclination to do well in certain academics which pertain to their interests.

### **DISCUSSION**

Our research has shown encouraging evidence on how nature-based education can increase students' naturalistic intelligence and stimulate their innate appreciation and awareness for environmental conservation. Nature-based education would be a feasible and promising

solution to many deep-rooted sustainability issues faced currently by fundamentally changing the mindset, values, and behaviour of the next generation. With an aptitude for naturalistic intelligence showing a higher degree of understanding of other living beings and identifying patterns of human behaviour, naturalistic intelligence interventions should be applied as part of a nature-based education to enforce skills in learning and cooperation. Recent studies connecting the education system and nature have shown that children need to identify with nature in the same way as they associate with the school playground (Chawla, 2015). There should be a structure of planned programming, allowing wider exposure to green space including rough playtime in the grass, teaching about various ecosystem elements and deep integration of mother nature in everything we do. Previous research has also found that students who spend more time immersed in natural settings and take note of simple observations they may come across may have increased academic competency and literacy skills throughout development (Johnson, 2014). This allows students to have stronger naturalistic

intelligence by facilitating ecological literacy. This experience helps students assimilate knowledge of sensorial observations in language and writing while also promoting creativity, expressiveness, and an increased enthusiasm towards academia (Johnson, 2014). Developing cooperation skills aids in supporting the needed societal changes to adapt to the climate crisis, as many of the solutions currently proposed for the climate crisis revolve around more cooperative living and closed-loop systems i.e., UN Sustainable Development Goal 13 Climate Action. By conducting naturalistic intelligence interventions with the growing generation, institutions will be able to better prepare the next generation of society to adhere to the required cooperative solutions of the climate crisis.

Alongside the societal benefits a nature-based education with naturalistic interventions would bring the benefits at the individual level further support the importance of nature-based education being adopted. Time spent in nature is associated with healthy individual wellbeing and fostering human development. White (2019) analyzed 19,000 people and found that 120 minutes

or more per week spent in green spaces contributed to healthy outcomes for all humans irrespective of gender, age, or ethnicity. Interestingly, there was no significant difference in general well-being between zero or low exposure (1-59 minutes/week) and there were better outcomes from direct “forest showers” or large forested areas over just living in proximity (White, 2019). According to a review of 40 literature articles, there is a positive link between green spaces by both increasing human lifespan and improving quality health, especially mental health (Van den Berg, 2015). In another study, the association between the quality of green space and the mental health of children was established. It stated that increased time spent closer to forests & green spaces (excluding parks) reduces chances of having severe health problems like asthma, obesity, and allergies in children by 11-35% (Dadvand P. V.-R., 2014). In human development studies, the relationship between green spaces and cognitive development in children aged 4 to 11 over a 1-year period conclusively showed that increase in green spaces at school, home, and commute improve their cognitive development (Dadvand P. N.-P., 2015). The study

established that there was 20-65% association between green spaces and an increase in mental capacity (Dadvand P. N.-P., 2015). Another likely explanation is that these increases in cognition are a result of an increased amount of time spent doing activities in green space. These studies that point to a human developmental need for nature as well as life-long exposure as part of an optimal healthy living suggests that a nature-based education model with naturalistic intelligence interventions point to being an avenue for bringing an increasing technological-dependent and urban-dependent society back to its roots. By bringing back a balance between modern society and evolutionary nature environments through incorporating nature-based education, the next generation will have a better balance and we predict a greater concern and care for the natural world - ultimately leading to increased conservation and sustainability with their generation.

Naturalistic intelligence can have common benefits for individuals in social and educational domains through its classifying patterns in the environment and identifying surroundings in contexts. Children learn from the environment at a

young age. To promote continual interest and development in naturalistic intelligence, continual naturalistic interventions and multiple activities is imperative. For example, naturalistic interventions through family, local nature organizations, teachers or other role models in their surrounding or global community, can support the growth and development of naturalistic minds. Childhood development has long advised of the positive effects of open safe and open play environments. Nature-based intervention program design aligns with this model and further contributes to our claim that Naturalistic intelligence based interventions would be a positive force for the next generation. Knowledge needs to be shared in an equitable manner for children to foster their interests. The current essay elucidates the research findings useful for implementing child psychology in a natural setting. Nevertheless, technical research work needs to be boiled down to digestible facts for members running the programs for quicker, efficient, and sustainable management. On that note, there are always better and forthcoming ideas from new research that can be assimilated into the

progress of extracurricular activities moving forward.

## **Limitations**

Children learning more about the natural environment will enrich them to make intelligent decisions on how to keep it clean. However, a few limitations act as barriers preventing children from truly understanding the context of nature., the field of naturalistic intelligence is underdeveloped due to its overall lack of support in the academic community. Research models that study human intelligence do not structure it into categorical models, whereas Gardner's Multiple Intelligence Theory does. However naturalistic intelligence is different from other accepted phenomena such as pro-environmental behaviour as it includes a near spiritual component to a connection with nature. We find this lack of inclusion in models like pro-environmental behaviour to be missing an important phenomena occurring on how and why people connect with nature. A line of research connecting people's pro-environmental behaviours with their spiritual connection to nature is not developed yet. Our research was limited in this way as we could only focus on studies using either



naturalistic intelligence or conceptual models like pro-environmental behaviour.

## CONCLUSIONS

Research has shown encouraging evidence on how nature-based education can increase students' naturalistic intelligence and stimulate their innate appreciation and awareness for environmental conservation. Nature-based education could be a feasible and promising solution to many deep-rooted sustainability issues faced currently, by fundamentally changing the mindset, values and behaviour of the next generations.

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intelligence and stimulate their innate appreciation and awareness for environmental conservation.

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