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Perceptions of Nature Connectedness among School Children

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ABSTRACT

Biologist E. O. Wilson coined the term Biophilia which says that humans have an inborn inclination towards nature, which can be nurtured through repeated contact with the natural world. But, the rapid technological advancement happened over the past years have led to lifestyles that are forcing individuals for indoor work, resulting in decreased contact with nature. Considering the development aspects of human being, the attention towards the environment in young age is critical, for long lasting impressions and physical and psychological wellbeing.

Children, growing up in a technologically advanced and globalized world have lost experiences with nature leading to "extinction of experience" a threat to conservation of biodiversity , biophobia –"the fear of living things, aversion and alienation from nature" and "nature deficit disorder". Interacting with nature is essential for harmonious growth of children. Through increased connection with nature, children can develop stronger conservation attitudes leading towards overall environmental sustainability in the future.

The Built environment of children features a huge range of educational buildings, from small nurseries to vast schools and university campuses in which children spend over 1000 hours a year. The school grounds is the most accessible built element for outdoor environment. But, these are designed with perspectives and priorities of adults such as neatness, ease of maintenance, surveillance, nature of sports offered etc. This research through literature studies and case studies of different schools in different contexts of the Dakshin Kannada region tries to explore the connection between children and nature within the school built environment. It concludes explaining the need for creating interconnection between children and the built

environment of schools and documents the requirements of children that can be implemented in design of future schools.

1. Introduction

The **WHO** Sustainable Development Goals talks about the creation of sustainable cities and human settlements. Sustainability can be defined as "the responsible interaction with the environment to avoid depletion and degradation of natural resources and allow for long-term environmental quality so as to ensure healthy lives and promote well-being for all at all ages". This can be attained through many ways and one of them is through the preservation and conservation of nature. Numerous studies have shown that an efficient way to promote positive attitudes towards biodiversity conservation is through direct and concrete experiences with nature [1] which also strengthens the emotional connection humans share with nature (biophilia) as well as improve overall wellbeing [2].

However, our future citizens – children, are growing up in a modern, technologically advanced and globalized world and are losing their experiences with the natural world restricting the development of emotional connect towards it [3].This decline in human interaction with nature in children may lead to "extinction of experience" which is a threat to the conservation of biodiversity [4]. There is seen a cultural shift in the playing habits of children from outdoors to indoors as well as a lack of emotional connection, inhibition and a general disinterest towards nature which creates a loss in direct and spontaneous connection with nature leading to "childhood of imprisonment" [5]. This disconnection with nature may lead to health complications like obesity, concentration disorders, stress among others and hinder the overall development of children [6].

2. Nurturing Biophilia through Schools

A. Understanding Biophilia

Biologist E. O. Wilson coined the term Biophilia which says that humans have an inborn inclination towards nature, which can be nurtured through repeated contact with the natural world [7]. Connection to nature is essential in increasing biophilic levels in children so as to promote positive conservation attitudes. Expression of biophilia must be triggered through association with nature at a young age where they start developing lifelong habits otherwise biophobia-"aversion towards nature" may develop [8].The concept of biophilia will help us to understand the closeness between nature and children in an ecological approach of developmental psychology [9].

B. Schools can nurture Biophilia

Children spend significant amount of time in schools and its built environment which gives us the potential to influence their association with nature. [10].However in schools today, children are confined to the indoor built

environment [11]. We should use the platform provided by these schools to create an environment where children are encouraged to engage with nature by integrating programs into the curriculum like outdoor learning programs and guided nature walks to induce biophilia in and make them more conscious about nature [6]. Programs like "the schoolyard movement" is a growing trend where schools 'green' their grounds to offer natural areas for children to build a positive social relationship with nature through multi-sensory experiences [12]. Incorporating naturalistic elements on school grounds motivates children to be active helping overcome the inactiveness that is usually seen during recess hours.[10].All the above reasons emphasize the importance of nature connectedness and its conservation to the psychological, cognitive, social, emotional and overall development and well-being of children [13].

3. Methodology

This segment gives a review of the research procedure, sampling technique, scale selection for measuring nature connectedness and the measures and strategies used to understand children's association with nature.

Nature connectedness is an important factor in determining the biophilic levels in children through understanding their feelings towards nature and sense of belonging when in nature. In this study, biophilic levels in children are measured by through a questionnaire to understand their connection to nature and document their perception and relationship with nature (both animals and plants).

There are many scales which can be used to measure nature connectedness in children. Few scales have been tabulated below which measure the three key aspects – affective, cognitive and behavioral aspects, of the human-nature relationship.

Table 1

Sr.No	NAME	YEAR	DEVELOPED BY	TYPE	MEASURES
1	"Emotional Affinity to Nature" (EAN)	1999	Kals, Schumacher, and Montada	4-factor measure	"Love of nature, Feelings of Freedom, Feelings of Safety, and Feelings of Oneness with Nature"
2	"Inclusion of Nature with Self" (INS)	2002	Schultz	single-item question	Considers the affective, cognitive and behavioural aspects.
3	"Environmental Identity Scale"	2003	Clayton	24-item scale	"spending time in nature, enjoyment of nature, learning about nature, responsibility for nature and oneness with nature"
4	"Connection to Nature Scale" (CNS)	2004	Mayer and Frantz	single-factor measure	an individual's affective, experiential connection to nature
5	"Nature relatedness Scale" (NR)	2008	Nisbet, Zelenski and Murphy	3-factor measure	cognitive, affective, and physical connection
6	"Connection to Nature Index" (CNI)-	2010	Cheng and Monroe	4-factor attribute measure 16 item scale	i)"enjoyment of nature" ii)"empathy for creatures" iii)"sense of oneness" iv)"sense of responsibility"

For this study, the most relevant and easy to be used scales were the Connection to Nature Index Scale (CNI) and Inclusion of Nature with Self" (INS).CNI scale was chosen since it had the highest internal consistency, easiest to understand and complete by the children, it measures the overall nature connection score and has sub scales too. It was specifically designed for children the targeted sample of the study and is also statistically reliable.

Connection to Nature Index Scale (CNI): This scale was created by Cheng and Monroe (2010) that measures children's connection to nature in 4 dimensions: a) enjoyment of nature, b) empathy for creatures, c) sense of oneness and d) sense of responsibility. "It is a 5 point Likert-type scale with 16 items ranging from 1 as strongly disagree and 5 as strongly agree. It is a trait measure scale which means that it measures changes in children's connection to nature over a long period of time like 6 months."

Inclusion of Nature with Self Scale (INS): This is a singular item scale created by Schultz (2002). It measures the extent that individuals include themselves in nature as part of their identity. It includes affective, cognitive and behavioral aspects of human connection with nature. It has 7 pairs of circles with varying levels of intersection and asks participants to choose which set they identify most with. In the case of this study, we simplified the scale to only include 5 pairs of circles so that we maintain the 5 point scale used throughout the questionnaire.

Children of age group 8 – 12 years are considered for the study as" this age group is a critical period of their cognitive development [14] and children at this age can experience their nearby wild or semi-wild natural world independently." [2].

The study is conducted on school children in Udupi district, Karnataka to understand their relationship with nature in the existing conditions and their preferences of spaces in their school built environment.

A. Study Setting

Udupi city lies in the state of Karnataka, carved out from Dakshina Kannada district and is notable for being a temple town. It has a population of 11,77,361 with a total area of 3,582 sq.km and population density of 329 per sq.km. 71.63% of the total population lives in urban areas and has a literacy rate of 78.69%. The city has a warm and humid climate with a monsoon period from June to September and has a dense cover of tropical evergreen forests.

The study was carried out across three schools all located in different contexts, different sizes having diverse school built environment. Since this study involves young children, an information sheet and consent form for the school and the students was prepared, informing them about what the study entails and asking for their permission to use their answers.

B. Instruments and Procedure

A questionnaire was prepared and divided into separate sections. General information was asked like age, gender and class for categorization when analyzing data. Section A of the questionnaire was based on the INS scale. It consists of 5 pairs of circles with varying levels of overlap, each circle in the pair labelled either as "Me" or as "Nature"- a slight deviation from the original scale where they were labelled as "Self" and "Nature" so as to be easily understood by children. The students were asked to tick the pair which they most identify with.

The main instrument used in this study was the CNI [16] used in Section B. This scale was chosen because it addressed the target sample of students aged 8-12 year olds to measure their feelings towards nature. It has a Cronbach's alpha of .87 in the original paper [15]. The questions were modified for the purpose of this study making them context specific but not changing the dimensions of the scale. Emoji faces were also added to the 5 point scale making it more interesting and interpretive for the students.

The questionnaire also includes sections where the students write about what elements they would like to have in the school compound and draw the spaces where they feel most connected to nature in their school built environment. This will help identify the key areas in the school built environment that promotes an increased association with nature in children.

C. Data Collection

Questionnaires were distributed among the students of 6^{th} and 7^{th} grade (age group 8-12yrs) in three different schools. The schools are labelled as SCHOOL-A, SCHOOL-B and SCHOOL-C. All the submissions were in the form of hard copies as was found convenient to give and collect from students. The total responses received from the schools were 620, however due to some inconsistencies only 606 responses were analyzed. The children did not have any trouble filling out the CNI Scale however they needed a little explanation for the INS Scale while the drawing exercise was enjoyed by all.

D. Data Analysis

The software Microsoft Excel is used to analyze the data collected from the CNI and INS Scales. The CNI scale has 16 items which can give us a score for the whole scale or scores in subscales (Table 2). A CNI score of 1-2 indicates a low connection to nature, scores of 3 indicate a moderate connection to nature and scores of 4-5 indicate a high connection to nature.

The INS Scale measures the individual differences in the connectedness with nature and follows the same scoring scale as the CNI Scale.The drawings made by the children are collected and the inference that is derived is whether they draw more indoor spaces like trees, plants or animals are present. This will show the nature connectedness in the children in the school built environment

and their preferences to outdoor spaces in their school along with the elements of nature.

4. Key Findings

Altogether, 606 children took part in the study of which 51% were boys and 49% were girls, shows an almost even participation from both genders. Ages ranged from 8 years to 12 years, although the majority were 10 year olds (Figure 1). The average age was 10.5 years old.

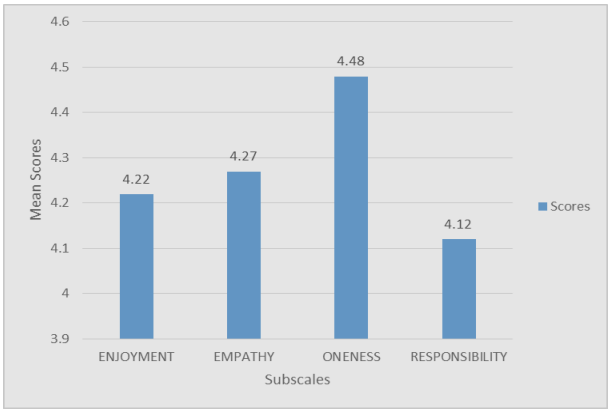


Figure 1: Mean scores of subscales of CNI Scale

Table 2

Connection to Nature Index - Subscale score items	
Subscale	**Questions included within the subscale**
Enjoyment of nature (7 items)	I like to hear different sounds in nature
	I like to see wild flowers in nature
	When I feel sad, I like to go outside and enjoy nature
	Being in the natural environment makes me feel peaceful
	I like to garden
	Collecting rocks and shells is fun
	Being outdoors makes me happy*
Empathy for creatures (4 items)	I feel sad when wild animals are hurt
	I like to see wild animals living in a clean environment
	I enjoy touching animals and plants
	Taking care of animals is important to me
Sense of oneness (3 items)	Humans are part of the natural world
	People cannot live without plants and animals
	Being outdoors makes me happy*
Sense of responsibility (3 items)	My actions will make the natural world different
	Picking up trash on the ground can help the environment
	People do not have the right to change the natural environment
*Although this question appears in 2 subscales, it is only asked once on the questionnaire	
Ref:Chen-Hsuan Cheng J & Monroe M. 2010. Connection to nature: Children's affective attitude toward nature. Environment and Behavior, 44(1), 31-49.	

The CNI scale score ranges from 1 to 5 with values from 1-2 indicating low connection with nature and 3-4 indicating high connection. The total mean CNI Scale score in this study was 4.27 and the subscales: enjoyment of nature;

empathy for creatures; sense of oneness; and sense of responsibility, all yielded scores above 3.9 as well. This implies the children are highly associated with nature. (Table 3)

Table 3: Mean Scores of the CNI Scale

Scales	SCHOOL A	SCHOOL B	SCHOOL C	Total
Enjoyment	4.19	4.15	4.31	4.22
Empathy	4.12	4.27	4.42	4.27
Oneness	4.24	4.56	4.65	4.48
Responsibility	3.90	4.17	4.30	4.12
Total	4.11	4.29	4.42	4.27

The mean scores are all very high with very little differences between the various schools although the scale of responsibility are the lowest overall (Figure 2) indicating that children believe their words or actions do not have any significant power to change their relationship with nature and they cannot affect the natural world in any major way. This shows that they need to be educated about the importance of conservation of nature and how they can actively affect it through their actions. Empowering the future generation is really important to nurture biophilia in children and it can be done through the school system.

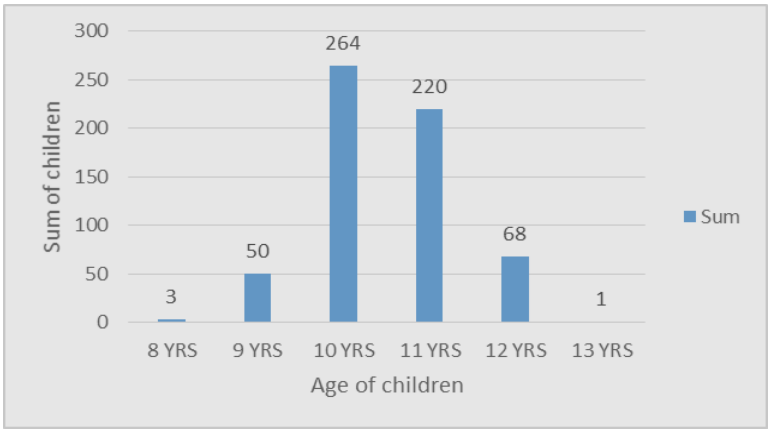


Figure 2: Age of children taking part in the study

The subscale with the highest mean score is the sense of oneness indicating that all the children in the study strongly feel that nature is connected to not only a part of themselves but in much larger scale with the whole world.

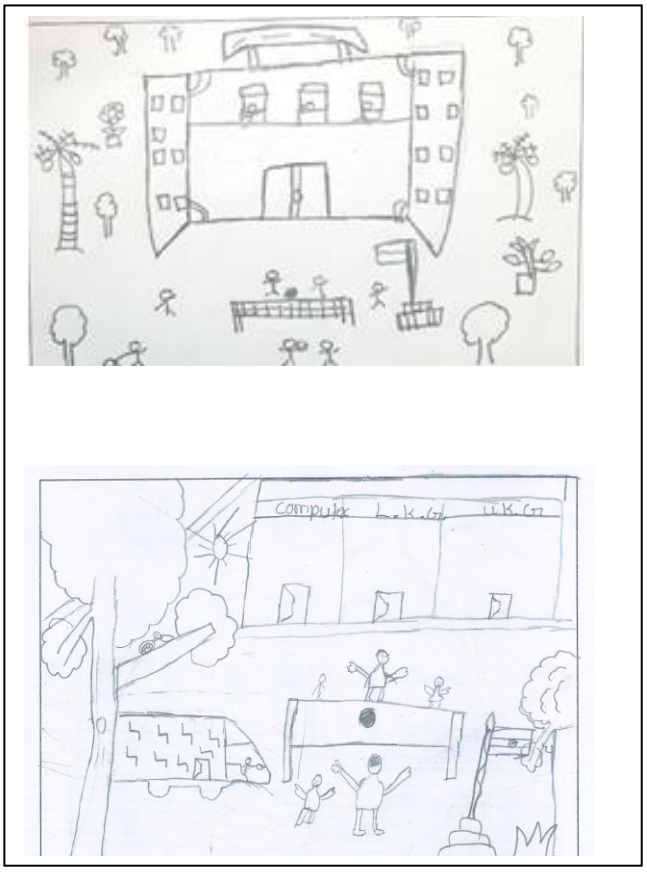
The INS Scale scores run from 1 to 5 with most children scoring over 3. The mean score was 4.22 overall which is also truly high indicating that the children who participated in this study are highly connected with nature. The mean scores of both the scales are similar which demonstrates that the children in this investigation are profoundly associated with nature.

A. Documenting children's drawings.

The children drew their favorite places in their schools. In SCHOOL-A, most of the students drew pictures of trees and their playgrounds (Figure 4) but the key thing to note was the consistent background of their school built environment. This shows the interaction of nature and built form in the school that the children are studying in. Statements from the children were also noted, stating what spaces they would like to have in the school in order to feel more connected with nature.

"*I would like to have animals connected to school in future*"

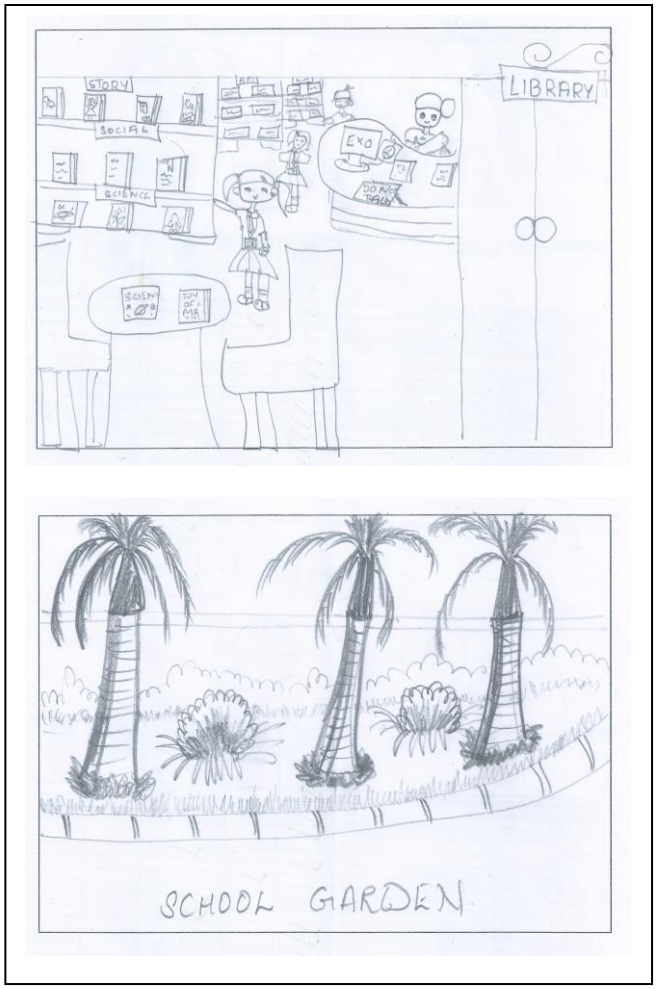
"*I would like Tulsi plant which is a medicinal plant and also trees which give us shade*."



In SCHOOL-B, the students drew pictures of their classrooms or of bare grounds which shows that there is scarcely any elements of the natural world present in the school built environment (Figure 5). They made statements such as:

"*I would like a green garden in my school … so that butterflies can come and sit on that*."

"*I want bird watching classes*"



The children of SCHOOL-C, drew a mix of indoor and outdoor scenes, but majority of them drew pictures of their school garden and playground (figure 6) the children wrote statements like:

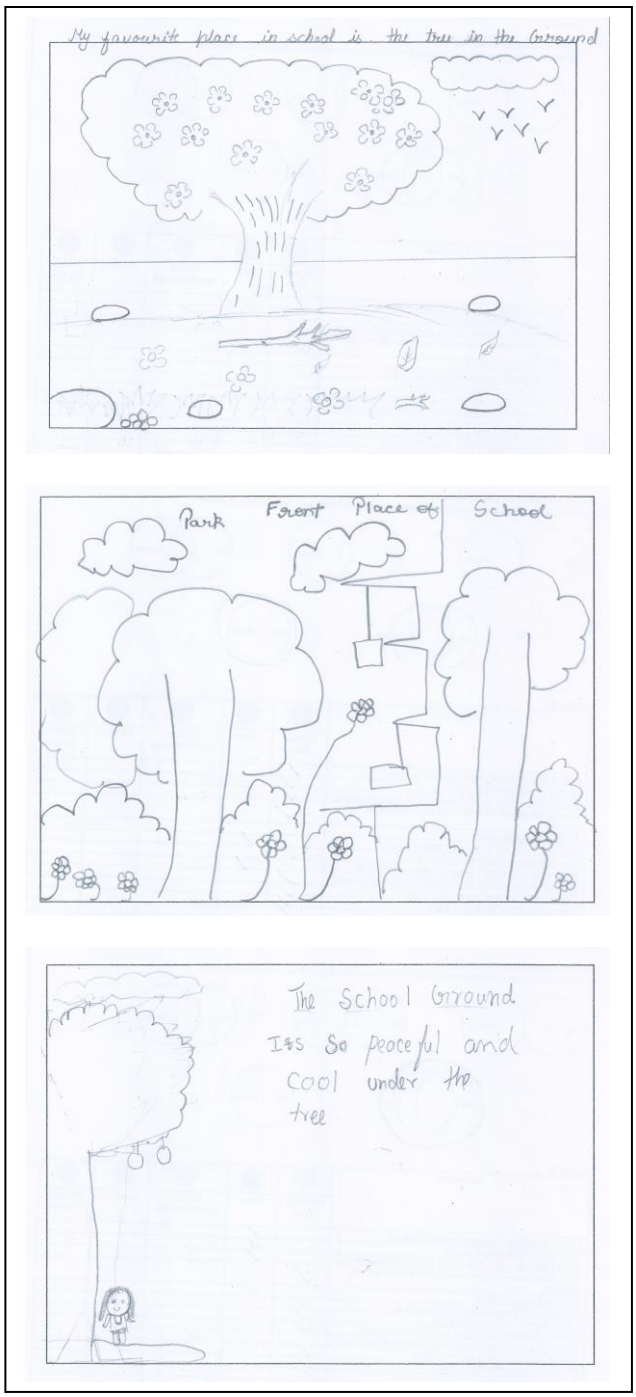
"...green plants should be kept inside the class."

"I want to plant more trees near school garden."

All their drawings represented what nature connection was to them, whether through trees, birds, playgrounds or even the view from the window of their classroom of the outside, children have to be connected to nature visually and physically to improve their social, physical and cognitive development skills as well as their overall health and wellbeing.

B. Discussion

This study showed that the children from all the three schools located in different contexts are aware of their relationship and connection to nature with high senses



of empathy and responsibility as seen above. However, their school built environment does not enhance or promote this connection. Statements like "I want a green garden to play in." should not arise in a school environment where they spend up to 7 hours a day. The images show that children's perception of nature is being influenced by the built form and although they have knowledge about nature they are not emotionally connected to it. Their concerns for nature are holistic yet they do not feel any individual

responsibility towards improving their natural surroundings as seen by their results.

C. Conclusion

The children in today's world are growing less and less connected with nature which is being slowly replaced by technology and hence they have very little direct connection with nature therefore low biophilic levels and higher biophobic levels. Their connection to nature should be encouraged which is established in the education system of these schools through various programs like going for guided nature walks in the vast tropical forests of Karnataka, having outdoor classes to increase direct connection with nature in the children, visiting bird sanctuaries and parks where they can learn about different animals to mention but a few. Furthermore this study could be used as a tool to help planners and architects to create guidelines to create spaces for children in schools to enhance their biophilic tendencies. All these methods will help in increasing biophilic levels in children, reduce their biophobia and hence enable them to build an emotional connection with nature which will in turn improve their conservation attitudes leading towards a more sustainable earth.

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APPENDIX

The sample of the questionnaire distributed to school children to understand nature connectedness in them.

Questionnaire
Please spare a few minutes to answer this questionnaire!

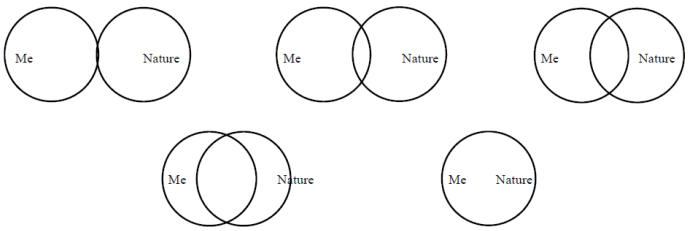
Please tell us whether you are: a boy ☐ or a girl ☐

Please tell us how old you are. _____

Please tell us what class you are in. _____

Section A

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



Section B

Statements	Strongly agree	Agree	Neither agrees/disagrees	Disagree	Strongly disagree
I like to hear different sounds of nature in school.					
I like to see wildflowers in school.					
When I feel sad in class, I like to go outside and enjoy nature.					
Being in the natural environment in school makes me feel peaceful.					
I like gardening in school.					
Collecting rocks and shells at the beach is fun.					
I feel sad when wild animals are hurt.					
I like to see wild animals living in a clean environment.					
I enjoy touching animals and plants in the school compound.					
Taking care of animals is important to me.					
Humans are part of the natural world.					
People cannot live without plants and animals.					
Being outdoors after class hours makes me happy.					
My actions will make the natural world different.					
Picking up trash on the ground can help the school environment.					
People do not have the right to change the natural environment.					
I enjoy looking out the window when I am free in class.					
I like sitting under a tree in the school compound.					

Section C

What features would you like to have in your school so that you are more connected to nature?

_____

Section D

Draw a picture of your favourite place in the school.

Thank you for filling out the questionnaire!