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Nature-connective educational architecting – an approach to education based on the life-sustenance hypothesis

Irina Salmi [1]✉

This theoretical paper aims to develop an ecological approach to education based on a framework for human-nature connection called the life-sustenance hypothesis. Human-nature connection has been shown to affect well-being, prosociality, and pro-environmental inclinations. Thus, enhancing nature connectedness in education could potentially have far-reaching consequences for future citizens' well-being, decision-making, and resilience when facing the polycrisis ahead of them. The life-sustenance hypothesis is based on the philosophical system of Jean-Jacques Rousseau (1712–1778), combined with contemporary scientific research and theoretical underpinnings. The hypothesis suggests that experiences of nature connectedness and altruistic impulses derive from a shared ground—the life-sustaining orientation—which protects surrounding life simultaneously with a self-sustaining orientation. The life-sustenance hypothesis further suggests, that in modern Western humans, an imbalance between these orientations has caused several challenges in the personal, societal, and environmental arenas. In this paper, the means by which to unlearn the excessive dominance of the individualistic, self-sustaining orientation are explored. Inspirational guidelines are offered to implement situation-sensitive 'nature-connective educational architecting', including, for example, adding natural elements and simulations of nature to the surroundings; providing opportunities for feelings of compassion and discouraging competition; and suggesting what to pay attention to when the educated are given regular opportunities to spend time in nature. Many of these means are already in use in environmental education. Here, the aim is to bring them together and provide a coherent theoretical explanation for why they are useful, and how to implement them influentially in education toward more sustainable manners of being.

[1] University of Turku, Turku, Finland. ✉email: imsalm@utu.fi

Introduction

In recent years, numerous authors have emphasised the urgent need to rethink environmental and sustainability education (Jickling and Sterling 2017; Pulkki et al. 2021; Wals and Jickling 2002; Lotz-Sisitka et al. 2015). One solution suggested has been to provide children with transformative experiences that would allow them to sustain 'new ways of being in the world' (Jickling 2017). In this paper, a novel approach to education, titled *nature-connective educational architecting*, is developed. It aims to provide opportunities for transformative experiences, but also to develop means by which the way of being in the world that results from these transformative experiences would never cease to be part of how we are in the world to begin with. In this paper, I suggest that one central means of achieving this goal is enhancing the nature connectedness of children.

Overall, human-nature connection (HNC) is a phenomenon currently under cumulative scientific interest. Research on HNC has revealed positive effects on physical and psychological health and functioning, and prosocial and pro-environmental inclinations (Barragan-Jason et al. 2022 & 2023; de Keijzer et al. 2016; Houlden et al. 2018; Oh et al. 2017; Putra et al. 2020; Shuda et al. 2020; Trøstrup et al. 2019; Weeland et al. 2019; Whitburn et al. 2019). Following Barragan-Jason and her colleagues (2023), in this paper, HNC is defined to consist of both (1) physical exposure to nature and (2) a psychological experience of being connected with nature. The psychological nature connectedness can be either emotional, cognitive, or transcending both, leading to an experience of immersive oneness with the natural world (Mayer and Franz 2004; Tam 2013). Across various fields, scholars have suggested that a growing disconnection from nature contributes to multiple societal and environmental challenges. In environmental education, Richard Louv's Last Child in the Woods (2005) is a seminal work, highlighting the impacts of what he called the nature deficit disorder.

Both empirically and theoretically, comprehending HNC extensively is crucial for pursuing corrective actions through education. The current paper adopts a framework for HNC called the *life-sustenance hypothesis* that I have developed elsewhere in more detail.[1] This approach is influenced by an interpretation of the philosophical system of Jean-Jacques Rousseau,[2] the writings of Erich Fromm (1964) on biophilia, Arne Næss' on (1973) deep ecology, and the contemporary philosophy of systems biology. The life-sustenance hypothesis provides a non-anthropocentric and biological explanation for why we experience nature connectedness and why it affects us the way it does.

The contribution of the current paper to the contemporary debate is the implementation of the life-sustenance hypothesis in the educational arena and in bringing Rousseau's educational thinking to contemporary terms by using adequate up-to-date, multidisciplinary research and theoretical underpinnings. Methodologically, it is an empirically informed philosophical paper. Thus, the paper falls under the umbrella of educational philosophy and environmental education, but it also has transdisciplinary crossings for instance with behavioural science and psychology. The elements selected from these different strands of science share a common underlying ecological and systemic worldview. Humans are viewed as organisms among other organisms, constantly adjusting and adapting to their surroundings, being seamless parts of the whole web of life.

Rousseau's impact on contemporary education has been remarkable; for instance, he initiated the idea of child-centeredness (Monteiro 2005; Platz and Arellano 2011) and had a prominent influence on the educational views of thinkers such as Immanuel Kant (2007), Johann Pestalozzi, Friedrich Fröbel (Collier 2023) and Maria Montessori (Goncalves 2013). Using Rousseau as the main source for educational implementation brings certain conformity to the project because the life-sustenance hypothesis is also based on his thinking. Rousseau's life's work can be seen as a holistic attempt to aim at one end—to argue for the importance of deep connectedness with nature.

It should be noted, that Rousseau's often seemingly paradoxical writing style allows for multiple coherent interpretations. Rousseau has been, for instance, criticised for being anthropocentric, and with good reason (Dent 1988, 240; Neuhouser 2008, 1.3). However, he often wrote also in a manner that contradicts this interpretation: *"Let us not say in our imbecile vanity that man is the King of the world, that the sun, the stars, the firmament, the air, the earth, the sea are made for him, that the plants germinate for his subsistence, that the animals live so that he might devour them"* (Rousseau and Kelly 2007, 189). I side with a non-anthropocentric reading. Furthermore, as Rousseau lived some 300 years ago, it should be added that some key notions, such as 'nature', might have had different meanings back then as opposed to how they are conceived today. Rousseau, in fact, used the word 'nature' with several different meanings (Lähde 2008). Given all this, the central tenet here is not whether how I present Rousseau's thinking is the historically correct one—it may very well not be.

I will use Rousseau's educational ideas selectively: some key practices are brought to the spotlight according to my interpretative perspective. It is not my intention to argue that his educational writing should be followed literally. This was not his attempt either: Rather, he pursued to articulate a certain kind of 'spirit' to be grasped and amended in situ by the educators (Rousseau and Kelly 2007, 177; Rousseau 1979, 38 & 192). Pivotal to Rousseau's educational thinking was to conduct slight changes in the educational environments of children and to gently steer them to learn themselves instead of straightforwardly telling them what should be learned: The educator's "…*greatest art is to provide occasions*" (Rousseau 1979, 247).

This paper will draw parallels between Rousseau's educational thinking and the nudge theory. Nudging refers to influencing people's choices by altering their '*choice architectures*', that is, contexts in which they make decisions (Thaler and Sunstein 2009). Decisions always occur in some context or another, and as part of each other's architectures, we cannot avoid influencing other people's decisions, whether intentionally or unintentionally. Nudging suggests that we could be more *intentional* considering this influence. The same can be said, this paper suggests, about educational situations. Considering the wide effects that behavioural sciences have shown that small alterations of choice architectures can have (Thaler and Sunstein 2009; Kahneman 2011), the current paper suggests further that also concerning education, we should perhaps pay more attention to which directions the architectures of the educational environments of children steer them. Providing children with opportunities to deepen their relationship with nature is pursued with what will be called nature-connective educational architecting, defined as *the intentional altering of educational architectures aimed to enhance the nature connectedness of the educated.*

I will first briefly describe the life-sustenance hypothesis, including some key terms of Rousseau—such as *amour-de-soi*, *amour-propre*, and *pitié*—with some equivalent ideas from contemporary considerations. I will then proceed to describe Rousseau's main educational idea of what he calls 'well-regulated freedom', and in the next section try to bring this idea to contemporary terms using behavioural scientific research and theory. I will further elaborate on Rousseau's view of the education theorist's role as conveying a spirit rather than prescribing specific guidelines. Following this, I will give examples of how this spirit could be applied: for instance, by adding natural elements

and simulations of nature to the surroundings, providing opportunities for feelings of compassion, discouraging competition, and suggesting what to specifically pay attention to when spending time in nature with the children.

Theoretical background: Rousseau's natural sentiments and the life-sustenance hypothesis

My interpretation of Rousseau takes him to be a representative of systems thinking, ranging through Western philosophical and scientific history but being especially prevalent in many Eastern and Indigenous cultures. In systems thinking, everything is connected and interdependent (Capra and Luisi 2014). In contemporary environmental education theory, Louise Chawla (2007) could be considered a representative of systems thinking (other examples include Bonnett 2017; Molina-Motos 2019).

The life-sustenance hypothesis starts with the assumption that the interconnectedness of life, structured as nested systems within systems, results in a *double relation with the world* in all organisms. This idea is prevalent in Rousseau's thinking, but also for example in contemporary systems biology, which recognises that all life forms strive towards (1) autonomy and self-sustenance and (2) integration (Moreno and Mossio 2015). Accordingly, the life-sustenance hypothesis suggests that all organisms share two intertwined orientations: the 'self-sustaining' and the 'life-sustaining' ones. The dynamics between these orientations show themselves in the whole manner of being, through species-specific characters. Both are needed: failing in either one can be considered a malfunction detrimental to the survival of whole systems of life, if prolonged and excessive.

We continuously fluctuate between these orientations: It is useful to see them as a continuum, where the right kind of balance is pivotal. From cells and bacteria to humans, self-preservation occurs via stress responses to the threats posed by the environment. The life-sustenance hypothesis suggests, that the integrative life-sustenance is most often expressed as species-specific ways in which organisms do not harm other life without a self-preservational need to do so.

To zoom in from the broader picture to human beings, our self-sustaining stress responses are largely induced by enhanced cortisol secretion (Sapolsky 2004). HNC, in turn, has been linked to decreases in cortisol levels (Shuda et al. 2020). Immersive experiences of nature connectedness, along with altruistic impulses, are suggested to be manifestations of the life-sustaining orientation—these are means by which harming other life without a self-preservational need is halted in our species.

In his time, Rousseau knew nothing of stress responses (invented much later by Hans Selye [1936]), but he used a specific term to describe the prevalent 'manner of being' of many modern, Western people: *amour-propre*, which referred to excessive self-centeredness resulting from certain kind of societal circumstances, causing the over-emphasising of perceived or imagined threats to status or other social factors (Rousseau 1979, 41, 212–213, 235, 252–253, 474–475; Rousseau and Kelly 2007, 179, 196). Inside Rousseau's system, *amour-propre* can be interpreted as an extreme, distorted, human-specific form of a natural sentiment he called *amour-de-soi*, a natural care for one's own survival that all living beings share.

Contemporarily we know, that as a highly social and cognitive species, humans have developed capacities to react with a stress response not only to life threats but also to anticipatory, social-psychological stressors, and that, specifically, in modern, Western cultures, this has led to severe health consequences (Sapolsky 2004). Following Rousseau's thinking, the life-sustenance hypothesis asserts that this has led to a situation where people tend to be constantly too close to the self-sustaining excessive end of the continuum with high cortisol levels, causing a deficiency of life-sustaining being in the world: Thus, the consequences of a prolonged, excessive social-psychological stress would expand to decreased altruism and pro-environmentalism.

When developed in the right kind of environment, *amour-de-soi* does not turn to *amour-propre*, but rather expands to another natural sentiment, *pitié*, a compassionate reluctance to see surrounding life suffer and a directly felt, almost instinctive inclination to help those in need (Rousseau 1979, 250−251; 2010, 32–34). In Rousseau's system, *pitié* is at the life-sustaining end of the continuum, together with an immersive nature-connective experience Rousseau called *harmony* (Rousseau 1927, 138–143). Contemporarily, Frans de Waal (2008) has described what he calls altruistic impulses that resemble *pitié* to a great extent. Charles Darwin (1871) called a similar phenomenon the 'sympathetic instinct'. Analogous to the self-preservational feeling of hunger, which induces a direct need that is alleviated by responding correctly, *pitié* also induces a direct need that can be alleviated by responding to the needs of others. If we fail to respond, no alleviation will occur. The modern, Western imbalance between the orientations is thus a problem not only because of the dysfunctions in caring for surrounding life sustainably, but the imbalance also affects the well-being of the organism in question.

This paper suggests that enhancing nature connectedness contributes to a balanced relationship between the orientations and thus to positive outcomes concerning well-being, prosociality, and pro-environmentalism. The dominant relations between the orientations are formed to a great extent during childhood. For a dominantly self-sustainingly oriented adolescent or adult, a change is more difficult, but manageable: for example, through 'transformative experiences' described by the post-sustainable theorists (Jickling and Sterling 2017).

Rousseau emphasised that the most important thing for a balance between *amour-de-soi* and *pitié* to develop is education (Rousseau and Kelly 2007, 62, 196) and the most important aim of education is to maintain that balance (in education, "*everything always consists in preserving or in restoring the natural sentiments*", Rousseau 1979, 389–390). He created a detailed story of the upbringing of an imaginary boy, Émile, to bring forth his approach to how a balanced manner of being is to be achieved. I will next describe some key ingredients of this education process and as I do, I will build a bridge to contemporary science through research and theories under current behavioral sciences.

Bringing Rousseau's educational thinking to contemporary times

Education as 'well-regulated freedom'.

> *"Make your pupil attentive to the phenomena of nature. Soon you will make him curious. But to feed his curiosity, never hurry to satisfy it. Put the questions within his reach and leave them to him to resolve. Let him know something not because you told it to him but because he has understood it himself."* (Rousseau 1979, 168).

Letting the children learn by themselves is characteristic of Rousseau's thinking no matter the societal circumstances where the education is happening. However, there are differences between the education of an individualistic culture versus more holistic, life-sustaining cultures. I suggest that one reason for this is that Rousseau seemed to view the orientations as 'contagious' between people (Rousseau 1997, 249). Contemporarily, biomarkers of the orientations such as cortisol levels, heart rates, breathing and brain waves (all these decelerate in HNC and accelerate or are in higher frequencies in stress responses) have been shown to synchronise between individuals (Herrando and

Constantinides 2021; Koul et al. 2023; Mayo et al. 2021; Papp et al. 2013). Therefore, one of the most powerful ways to bring up children with a balanced relation with the world might be to exhibit one. *Émile*, however, is raised in a chiefly individualistic environment where the upbringing needs more thought.

Rousseau emphasised that the manner of being in the world should be developed to be a balanced one *before* teaching appropriate knowledge with which we can then reason our ways as parts of our environment. Rousseau wanted to avoid a situation where children learn only to obey rules without understanding why they should act or think in a particular way. Today, we know that environmental knowledge in itself is not enough to change behaviour accordingly (i.e. the 'knowledge-action gap', f. ex. Kollmuss and Agyeman 2002). Following Rousseau, the idea of nature-connective educational architecting is to bridge this gap by enhancing the life-sustaining orientation to support the knowledge acquired.

Rousseau is often taken to be the founding father of laissez-faire parenting, but in fact, he did not suggest leaving the children to grow on their own. Instead, Rousseau states that the only instrument that can succeed in a proper education is '*well-regulated freedom*' (Rousseau 1979, 92). Nature connectedness is not something one can share as rules to obey, or universally verbalise: it has to be experienced to know. So how can we pass it on from generation to generation? According to Rousseau, by gently steering—or nudging—the children towards it: "*arrange all around him the lessons you want to give him without his ever thinking he is receiving any*" (Rousseau 1979, 120): "*He will doubtless have to be guided a little – but very little, without it becoming apparent*" (Rousseau 1979, 171; See also Rousseau 1979; 112; 1997, 689).

Contemporarily in behavioural sciences, *nudging* refers to influencing the automatic decision-making of people by altering the *choice architecture* of a given situation in a manner that aims to nudge them toward choosing in a particular way (Thaler and Sunstein 2009). A classic example is how the dishes are presented in a lunch buffet—people tend to choose what is first or most easily available. The basic idea of nudging is very close to how Rousseau constructed his education process, although with important caveats. According to Rousseau, from very early on, what objects are around an infant is pivotal (Rousseau 1979, 62–63, 112). Contemporary behavioural science has shown with a notable amount of evidence a phenomenon called 'mere exposure effects', where almost anything— such as words, pictures, faces, or even meaningless figures—is rated more preferably when presented more frequently (Zajonc 2001). In fact, our intuitive, automatic decision-making process responsible for most of our daily micro-decisions works with what is available; it does not even pose the question of whether something extremely relevant is missing from the picture (Kahneman 2011). Accordingly, if one lacks nature exposure, nature might end up being conspicuous by its absence in the decisions one makes.

Instead of trying to influence decisions one at a time like the nudge developers, Rousseau aimed to steer towards balanced orientations and in that way, affect all our decisions and actions in the long run. I will call this approach *educational architecting*. The initial theory on nudges provided by Thaler and Sunstein (2009) provides a *methodological* basis for nature-connective educational architecting because Rousseau—although having a deeper aim at sight—often uses similar methods when pursuing his educational aims. Therefore, next, a short introduction to nudging is in order.

Nudging: The methodological basis of nature-connective educational architecting. According to Thaler and Sunstein, a nudge can be described as "… *any aspect of the choice architecture that alters people's behaviour in a predictable way without forbidding any options or significantly changing their economic incentives*" (Thaler and Sunstein 2009, 6). The idea of nudging is thus to render some of the options easier, effortless, or more desirable than others. All decisions have some kind of architecture, and often enough, we face circumstances where the decision situation has to be arranged one way or another. The staff in the lunch buffet must put their products in some order for the customer, and it matters what arrangement is chosen. Analogously, and in line with 'mere exposure effects', whether nature is present in children's lives is constructed of endless little decisions that educators face daily; how are the yards arranged? Is nature present indoors? Are children provided with merely mass-produced toys or natural elements to play with?

Since nature-connective educational architecting will not aim at changing the architectures of some specific choices but rather the whole decision-making process in general, instead of a choice architecture, the architecture to be altered is called 'educational architecture'. The practice aims to intentionally *influence the education of children by organising the context in which they are educated*. It is based on the idea that also all education occurs within a contextual structure, always embedded within an environment that will influence the outcome somehow anyway.

Nudging is principally based on the behavioral scientific work concerning decision-making conducted by Daniel Kahneman and his collaborators and followers since the 1970s. Based on their research, Kahneman (2011) formulated a 'dual process model' that divides thinking and deciding into two interconnected modes or 'systems', which correspond roughly with reasoning ('system 2') and intuition ('system 1'); deliberate, effortful thinking versus spontaneous, effortless, unconscious search or computation. Most decisions, they have found, are based on intuition in this sense: Constantly using only System 2 would, in fact, make us completely dysfunctional in the continuous flux of everyday life.

This challenged the prevalent 'rational agent model' of economist theories, which presumes that people make fully logical and rational decisions with full knowledge of the situation, maximising one's own advantage. By revealing how heavily we actually rely on our intuition instead of reasoning, Kahneman's research indicated vividly that we are limited creatures with limited minds. It would be even evolutionary destructive to rationally and logically consider every decision we take—too slow, and too demanding. Instead, we use mental shortcuts and 'rules of thumb' to reach fast decisions. Kahneman (2011) asserted that this makes our decision-making mainly—well, irrational.

Rousseau, on the other hand, firmly believed in the wiseness of intuition: he asserted that the most sensible thing to do is often, if not always, the intuitive one. Logical reasoning can easily distort our natural being in the world: "*In everything let us limit ourselves to the first feelings that we find in ourselves, since it is always to them that study lead us back when it has not led us astray*" (Rousseau and Kelly 2007, 197). Therefore—although Rousseau's idea of intuition differs somewhat from that of Kahneman's—the dual processing model (and therefore nudging, too) with its irrationality assumption can be said to be in contradiction with Rousseau's worldview.

Kahneman was a follower of the Nobel-laureate, economist Herbert Simon. Along with the line of research that Kahneman represents, there is another line of research following Simon's work: one represented perhaps most visibly by Gerd Gigerenzer. This research tradition takes an ecological starting point, advancing systems thinking in the field of behavioural sciences. Their view of humans—like other organisms—as seamless parts of their environment aligns well with Rousseau's system of thought. Therefore, to bring Rousseau's educational thinking to contemporary times also theoretically, let's have a look at what

Gigerenzer and his collaborators mean with what they call *ecological rationality*.

Ecological rationality—the contemporary theoretical basis of nature-connective educational architecting. Gigerenzer and his colleagues stress that even if we could, it would not be 'ecologically rational' for us to first obtain all the relevant information and then use our maximum computational capacity to reach conclusions in everyday situations. Artinger et al. (2022, 601) define ecological rationality as "*the degree to which a strategy is adapted to the environment, evaluated in terms of a fitness measure such as profit or accuracy of predictions*". The best option for rational behaviour, thus, is to *use* the mental shortcuts and rules of thumb evolution has provided us with: Otherwise, we would be lost in the micro-decisions and would probably soon be overrun in evolutionary development. Consider, for example, how driving a car becomes automatic once you have done it long enough. It would be even dangerous if one had to always consider rationally each decision taken in traffic. This kind of automatisation of decision-making is not 'irrational' in Gigerenzer's view: it is the most rational thing to do in order to survive.

Kahneman (2011), in fact, also speaks of a similar issue in passing: The intuitive system 1 has been shaped by evolution to provide a continuous assessment of the main problems that organisms must solve to survive. Gigerenzer (2021) explains further, how humans among other animals have during evolution acquired special abilities, including embodied, innate, or learned mental shortcuts and rules of thumb that use all the capacities of the mind and the body: for example, sensorimotor, cognitive, and empathetic ones. Gigerenzer's standard example is a player catching a ball. Instead of consciously calculating the effect of the wind and the velocity of the ball etc., in an embodied way the player just knows when the catch should be done and where. Rousseau's *pitié* works similarly, guiding our responses to the world—given that it has been developed properly, and our dominant manner of being allows us to follow it.

Gigerenzer and his collaborators pose themselves as opposed to nudging, claiming that instead of taking advantage of the alleged 'irrationality' (the intuitiveness) of our thinking like nudging does, we should rather improve the decision-making skills of people: for instance, by teaching them how to become more acknowledgeable and effective with these intuitive shortcuts in order to reach better decisions in the future (Gigerenzer 2018). Nature-connective educational architecting shares this more far-reaching goal, but following Rousseau, the methods are very similar to nudging. Therefore, it is positioned in between these different lines of research after Herbert Simon's seminal works.

Now that the methodological and theoretical background of educational architecting has been introduced, it is time to move toward practical implementation. First, a few words about situation sensitivity, and then some considerations concerning how educational architecting could be implemented to enhance nature connectedness of children.

'The Spirit' instead of universal rules. Rousseau believed that simply providing children with knowledge and rules is insufficient and should even be avoided to some extent until the time is right: We learn by acting, he maintained (Rousseau 1979, 99–100, 168, 389–390; Rousseau and Kelly 2007, 121; Rousseau 1997, 460–461). In particular, as a direct, responsive basic need, the compassionate *pitié is* not something that can be taught by setting and memorising rules and then praising and blaming according to obedience. Teaching it through rules is similar to teaching to ignore the bodily signs of being thirsty and to drink only when a set rule tells one to.

But what would a life-sustaining upbringing look like in practice? We already know it has to do with making slight changes in the environment of the child: what objects are available and what not, what others are doing, how others relate with the world, and how they respond to the actions of the child. However, there is a catch, which makes proceeding toward practical implementation challenging. Rousseau (1997, 462–464) stressed that how to educate is always relative to the child—one must know the child to know how to alter educational architectures: "*My examples, good perhaps for one pupil, will be bad for countless others. If one catches the spirit of these examples, one will surely know how to vary them according to need.*" (Rousseau 1979, 192).

Thus, there are no uniform strategies that can be applied to all children, although some adjustable guiding lines can be drawn. The dominant roles of the self-sustaining and the life-sustaining orientations are personal, and due to different life histories, the same stimuli can have various effects. Moreover, not only do children vary, but so do educators. Educating towards nature connectedness is always a reciprocal, intertwined in situ process. Rousseau emphasised that what he writes should not be taken word for word but, instead, as inspirational discussions, from which only what aligns with one's own 'inner voice' should be applied: one has to 'catch the spirit' from the examples and then implement it to fit the circumstances (Rousseau and Kelly 2007, 177; Rousseau 1979, 192).

What Rousseau describes in *Emilé* is a goal to strive towards: the closer one gets, the better, and even trying makes already a difference (Rousseau 1979, 95). However, the point is not to draft a specified, detailed, and documented preplan for each child. To understand why, it helps to remember that the dynamics of the orientations can be seen in everything, also in how we think and approach matters. The self-sustaining orientation needs to see the world as separate parts because it is focused on self-preservation, to preserve one part of the whole. When approaching the world as separate entities, categorisations, conceptualisations, and logical inferences are needed for the world to be understandable and manageable, and careful documentation helps in trying to manage the details. This is a very useful way to make sense of the world, one that we, as a highly cognitive species, have developed to navigate our environments successfully. However, this is not the only way. Modernity, with its emphasis on individuality and rationality, has emphasised this approach to the detriment of other powerful means: for example, the embodied intuitiveness discussed earlier. Because we humans are also a highly social species, those intuitions respond also to social—and educational—situations.

The approach developed here could, in practice, be implemented as a cocreational intervention in which theory and examples are adjusted and personalised by educators (and the children themselves) into their daily practices. In the next section, I will attempt to provide such broad examples. Many of the practices introduced are in use already, and their effectiveness on nature connectedness of children has been studied (f.ex. Acar and Torquati 2015; Barrable and Booth 2020; Hu 2022; Jorgensen 2016; Lee et al. 2021). They are also present in the thoughts of many contemporary environmental education theorists (f.ex. Barrable 2019; Giusti et al. 2018). The educational approach developed in this paper offers a coherent explanation for why these means can be effective and provides ideas on how to best apply them. Understanding the theory behind the practice will help one to see some pitfalls as well as reasons for success.

Nature-connective educational architecting in practice

The educator as an altered factor of the architectures. The tendency of the biomarkers of the orientations (such as cortisol

levels) to synchronise with others around is crucial for the development of nature connectedness as well as in hindering it. Therefore, one of the most influential ways to influence children's nature connectedness might be to deepen one's own. However, whether one can use this idea as an intentional alteration of educational architecture is questionable because one cannot force oneself to connect with nature; this is also true for educators. When born and lived in modern, Western, and individualistic cultures, the effect may even be the opposite. Educators can be mindful and sensitive to this—and perhaps try to influence their own nature-connective architectures.

Educators can also be seen as one altered *factor* in educational architectures. First, it is important to have long-lasting educational relationships because of the importance of knowing the children well to successfully alter the educational architectures. Second, attention can be paid to the child's reactions when they harm other living beings of any kind, as well as to how the educator interacts with other living beings in daily encounters (Rousseau 1997, 349; 1979, 226). Imitation, affirmation, and the contagiousness of emotions and compassion are all powerful ways to affect *pitié*. Rousseau suggested that when the orientations are in balance, we responsively, without effort follow what he calls the natural maxim: "Do your (own) good with as little harm to others as possible".[3] If small harm is neglected— 'boys will be boys', or, 'it was just a joke' —it is silently accepted. As Rousseau (1979, 105) puts it: "*the only lesson of morality appropriate to childhood, and the most important for every age, is never to harm anyone.*"

Giving opportunities for feelings of compassion and discouraging competition. Altruism and prosociality have been linked to nature connectedness in contemporary research (Putra et al. 2020; Weinstein et al. 2009) and the strengthening of empathy has been used in environmental education (see f.ex. Barrable 2019). However, the reasons for the link between them and the causal direction of the link have remained somewhat unclear. Based on Rousseau, the life-sustenance hypothesis suggests a reciprocal, synergic relationship. According to Smith et al. (2009), giving to others leads to decreases in cortisol. However, the research on the relationship between cortisol and altruism has in fact produced contradicting results. Perhaps this is because one can act altruistically also when motivated dominantly self-sustainingly if one thinks it will advance one's own survival: this is called the 'tend-and-befriend' survival tactic, as opposed to the more known 'fight-or-flight' tactic (Taylor 2006). Moreover, the research often concentrates on the effects of acute stress responses rather than the prolonged, excessive stress responses more relevant for the life-sustenance hypothesis (see f.ex. von Dawans et al. 2021).

Following Rousseau, an educational situation where a child can feel the distress of another being and is able to respond to the need can be considered as nature-connective educational architecting. Because we learn by acting, merely watching a touching movie does not produce as strong an impact. Witnessing too much suffering is not good (Rousseau 1979, 231). The ability to respond and help, or at least to witness the relief of distress, is crucial. Furthermore, if the children are commanded to help, the effect is questionable (Rousseau 1997, 464; 1979, 172)—although, it is a start: *"It is in doing good that one becomes good"*, Rousseau (1979, 250) maintained. Helping thirsty birds, bees, or small animals in trouble could be considered examples of this.

Discouraging competition and overall comparison to others (Rousseau, 1979, 226) also functions as nature-connective educational architecting. The purpose in this case is to hinder the development of *amour-propre* and thus the dominance of the self-sustaining orientation. It does not straightforwardly nudge toward nature connectedness, but since the orientations are present in us on a continuum, it also matters how the other extreme pole is enhanced or reduced. Thus, if a competitive play is arranged on a nature trip, the effects of nature exposure may be diminished.

Natural elements in the surroundings. Both Rousseau and contemporary nature exposure studies emphasise the positive effects of having nature around. The key is not to bring children to national parks twice a year; what matters is that the presence of nature is regular, even daily. Thus, adding natural elements to the yards and sceneries from windows of kindergartens and schools would be beneficial (Rousseau 1996, 100; 1997, 394). HNC research has indicated wide positive effects of natural views from windows (Ko et al. 2022, Ulrich 1986 and 1981), and as noted already in the beginning of this paper, the effect of green spaces is well studied. Furthermore, Rousseau encouraged gardening with children (Rousseau 1979, 98–99; 1997, 398–399), which has also in contemporary research been shown to have many advantages (Soga et al. 2017, Winkler et al. 2019).

The effect of nature is stronger when it is not molded by humans (Korpilo et al. 2024; Wyles et al. 2019). When nature is forced 'to come and live with us'—instead of us living among nature—something is always lost (Rousseau 1997, 394–396; 1996, 631). Rousseau preferred natural meadows rather than lawns, forests rather than city parks and lakes rather than fountains. At the very least, when bringing nature to live with us, it should be done appreciatively, in as natural a form as we can. Thus, Rousseau preferred (1) no symmetrical lines and (2) combinations of plants, trees, and water with meandering trails such as in natural surroundings. Once nature is brought in, Rousseau advises allowing it to take care of itself—to form into whatever it will without controlling its ways. These ideas could be implemented also in playgrounds and city parks where children (and adults) spend their time. Perhaps not as much cutting the lawn but instead planting some seeds to create meadows with flowers that deal well with trampling? This would also benefit the bees that protect biodiversity.

Contemporary studies show that even houseplants can affect us (Kellert 2018; Lee et al. 2021; Weinstein et al. 2009). All is not lost even if we cannot wander among the soft mosses of ancient forests. There is a whole area of investigation concerning the placement of nature in our buildings and areas where we spend time, called biophilic design (Kellert 2018). Many of its methods could be implemented straightforwardly in nature-connective educational architecting.

Nature-connective educational architecting when in nature. There are means to make time spent in nature more effective: to be in nature without a rush to be anywhere else, to have no other pedagogical goals, and to have no structured play or before-planned programs of what to do there (Rousseau 1979, 168). It would also help to arrange time as free of social contacts as possible (Rousseau 1996, 237; Rousseau and Kelly 2007, 191, 198–200, 310): The main aim here is to lessen the contagiousness of the dominating self-sustaining orientation by giving the children chances to be alone with nature. The educator would ideally be somewhere nearby to see if the situation needs guidance (Rousseau, 1996, 269, 629; Rousseau and Kelly 2007, 199–200; Rousseau 1979, 172).

According to Rousseau, another effective means is trying to empty the mind of interfering thoughts (Rousseau and Kelly 2007, 198–200). Contemporarily, nature connectedness and some meditation practices have been linked in research (Schutte and

Malouff 2018). Meditation or mindfulness practices can be taught to children (Hooker and Fodor 2008). Rousseau (Rousseau and Kelly, 2007, 200) further suggested, that a moderate movement, caused by either one's own body or something else, helps with finding the temporary state of mind he calls 'harmony', the extreme end of the life-sustaining orientation where oneness with the natural world is felt. He gives an example of a boat slowly drifting in a lake. Developing this thought further would require focused research, but interestingly, rocking has been shown to increase slow wave activity in the brain (Bayer et al. 2011), which in turn is also related to HNC (f.ex., Koivisto et al. 2022). In practice, this could be implemented in early childhood care by napping outside in hammocks, or by arranging green areas at schools with for example rocking chairs.

Social situations in nature can also be architected towards nature connectedness. One such means is non-competitive free play, one of the main procedures that Rousseau (1979, 130–131) uses especially with younger children.

Simulations of nature. Drawing from contemporary HNC studies, one effective procedure—and most likely the easiest to conduct in practice—is simulating nature: pictures, sounds, videos, or even virtual reality experiences. They help the intuitive system by keeping nature present. If children are not exposed to natural elements, their system 1 tends not to take nature into account at all: nature does not exist for their intuitive processes. Due to the 'mere exposure effects' discussed earlier, the pictures influence pro-environmentalism even without straightforwardly changing feelings of nature connectedness. However, this may affect the balance between the orientation in a similar detour manner to the practice of kindness: pictures initiate pro-environmental action, and acting pro-environmentally enhances the life-sustaining orientation. We learn by acting.

Rousseau alluded that *pitié* is easiest to invoke toward beings that are similar and close to us (Rousseau 1979, 225; 1998, 307: For a contemporary view, see de Waal 2008). Thus, one way to encourage *pitié* toward natural elements could be personising nature, in order to produce a feeling of similarity or closeness. For example, by picking up a favourite tree, giving it a name, and taking a picture to hang it somewhere where private time is spent. Humans have the capacity to see faces where there are no faces—this ability could also be applied in personising nature.

The simulations also have a direct effect. For instance, simply assuming that an ambiguous sound is natural can lead to calmer brainwaves (Koivisto et al. 2022). Furthermore, some stress-related forest bathing studies indicate that anticipating nature exposure already lowers cortisol levels (Park et al. 2007). Here, the effect may be top-down rather than bottom-up, guided by our assumptions and interpretations.

Conclusions

This paper aimed to elucidate the educational philosophy of Jean-Jacques Rousseau and bring it into contemporary relevance by integrating it with current research and theoretical frameworks. The approach to education created in the process, nature-connective educational architecting, has numerous components that are already acknowledged in the field of environmental education. This is in and of itself not surprising, given how huge an impact Rousseau has had on many educational thinkers in the past. Nature-connective educational architecting offers a comprehensive theoretical background for these practices with a coherent framework on nature connectedness and its importance to us humans. Through this framework, some practices arise as more central than others, while some practices can be seen as even harmful. The value of this approach also lies in its ease of implementation: changes can be simple adjustments in behaviour or increased awareness of the environment—without requiring major curricular reforms. Its situation sensitivity further enhances its practicality.

The purpose of the paper was also to advance from theory into practice. However, in line with Rousseau's thinking, no specific manuals were constructed. It is not a procedure that one can learn from books and master universally perfectly. Rather, a certain spirit can be learned from the examples given here or in *Émile*, to be cocreationally adjusted with other educators and children in situ. It is about trusting one's own social and educational embodied intuitions to lead the way toward upbringing future citizens who have strong inclinations to care not only for self-survival but also for the survival of all life they come across. The multifaceted environmental and social crises ahead of future generations entail not only knowledgeable people but also people, whose underlying orientations support the difficult choices they need to make. The future polycrisis is not solvable from self-centered standpoints.

In the future, a thorough ethical consideration of nature-connective educational architecting should take place. Nudging has been ethically challenged by the question of whether freedom of choice is preserved when being nudged. In education, this is closely related to the question of indoctrination. Children should not be coerced or manipulated. Concerning nature-connective educational architecting, where the goal is not in altering choices but in enhancing the life-sustaining orientation, coercion is in fact not possible—one cannot even force oneself to connect with nature. Furthermore, the importance of not coercing is woven into the educational thinking of Rousseau (1997, 464; 1979, 172): coercion would spoil the process. As Jickling (2017, 27) notes, when describing the 'transformative experiences' pursued in post-sustainable education; "*We do not create transformative moments, but can create spaces for them to arise*". In the language of the life-sustenance hypothesis, transformativity refers particularly to unlearning the excessive dominance of the self-sustaining orientation when it already has the dominant role, while I have also explored means in which to maintain the balance between the orientations healthy since childhood. However, some of the suggested alterations of educational architectures, such as arranging solitary time in nature, can also create spaces for transformative moments for children who are under a strong influence of excessively individualistic self-sustaining orientation in their social spheres.

Rousseau stated that guiding children toward a balance between *amour-de-soi* and *pitié* is central in education throughout, but especially during the earliest years (Rousseau 1979; 42, 112). If not paid attention to, education can work the other way too: it may enhance *amour-propre* (Rousseau 1979, 48). Humans (among all organisms) are always in some choice architecture or another. If we do not pay attention to the architecture, it will guide wherever it is guiding, without us having anything to do with it. Educating without taking into account the educational architecture is similar to driving on the motorway with the first gear. Ethically speaking, perhaps we should even be *responsible* for paying more attention to the educational architectures since they potentially have such a tremendous effect on the well-being of future children and their living environments. To not pay attention to them steers into a direction unknown, while education on the contrary is an activity with a clear goal in mind. The goal is far more reachable if we use more than one gear to reach it.

Data availability

This research does not involve the analysis or generation of any data.

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Notes

1 Salmi, I. (under review). *A Systems Approach to the Human-Nature Connection: The Life-Sustenance Hypothesis*
2 Developed in more detail in Salmi, I. (under review). *A Systems Approach to the Views of Jean-Jacques Rousseau on Nature Connectedness*
3 *"Fais ton bien avec le moindre mal d'autrui qu'il est possible"* (Rousseau 2015, 40), translation by the author.

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The sole author, IS, is responsible for all aspects of the work done in this article.

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The author declares no competing interests.

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Ethical approval

Ethical approval was not required as the study did not involve human participants.

Informed consent

Informed consent was not required as the study did not involve human participants.

Additional information

Correspondence and requests for materials should be addressed to Irina Salmi.

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