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Article

# Storytelling as an Educational Tool in Sustainable Education

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**Abstract:** In this theoretical paper, a multidisciplinary framework is structured to enable the formation of a shared understanding of the need to combine education for sustainability, traditional knowledge, transformative learning, systems thinking, and storytelling. The paper summarizes results from some fairly new studies on sustainability implementation in education, recognizes problems, and provides alternative suggestions on how to address problems that prevent the integration of sustainability in education. An increase in ecological illiteracy in society and lost contact with nature seem to occur within the now-growing generation. In research literature, it is largely agreed that systems thinking needs to be developed in order to understand the concept of sustainability. Reviewing research in the field, systems dynamics, simulations, and case studies are highlighted as possible pedagogical tools to emerge in the understanding of sustainability. However, do we still only preform information transformation? To transform both education and society, transformative learning must be adopted. This paper would like to emphasize the capacity of storytelling to make sustainability more easily accessible. Storytelling as a pedagogical tool for learning sustainability is still a bit overshadowed, but the idea of sustainability can be traced far back in aboriginal cultures, where storytelling has been used to transfer traditional knowledge from one generation to the next.

**Keywords:** sustainability; transformative learning; systems thinking; storytelling; traditional knowledge; education



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## 1. Introduction

I grew up in the countryside and as child I spent a lot of time in nature. I also spent a lot of time with my grandmother and grandfather. They taught me some of the most important things I think I have ever learned. My grandmother taught me, for example, how to reuse old clothes to make other products. She taught me which foods you could reuse and how to do so, even though it was ready for the bin. My grandfather taught me where to grow potatoes and other crops, how to take care of the soil, and the importance of the ecosystem and biodiversity. He also taught me where and when to collect the delicacies of the forest, how to find your way through the woods, how to make a fire, and how to split wood. These were things you needed to know to survive in the old days, when grandmother and grandfather were small. I was lucky to have two great storytellers as teachers. My own children lack almost all of this knowledge and these skills, even though I have tried to teach them. However, it is a quite different world to grow up in for a seven-year-old girl today than it was forty years ago.

Today, more than half of the world's population lives in cities, which has also affected children's contact with nature, even here in the Nordic countries where we still have quite a lot of nature left. The technology has been developed so that children largely live their social lives online. They do not take their bikes over to each other or spend hours outdoors, either in the country or in town. The rural life has also changed dramatically during the last decades; today's rural children have a much more "urban" relationship to nature than previous generations in rural areas. The children no longer participate in agriculture and they are often transported to and from activities by car or bus, perhaps even to a greater

extent than the children in town. Free movement in nature has decreased and, thus, also spontaneous contact with nature [1].

The disconnection from nature seems to increase some of the problems society faces today. A great number of modern humans are reported to suffer from loneliness and a lot of people report that they feel a lack of control and a feeling of having no purpose. These factors lead to fear and chronic stress. We were not designed for, and do not belong to, the environment we now mostly live in, indoors sitting in front of different technological equipment [2,3].

Behavioral disorders and anxiety disorders in children have increased; fitness has deteriorated and overweight children are becoming more common. This may be a consequence of reduced contact with nature. The reduced contact with nature also results in children becoming afraid of both animals and plants in nature. This, in turn, might lead to a lack of interest in getting involved in climate and environmental issues. The long-term effect of children's lack of contact with nature can thus have a negative impact on the health of our planet. You have to get to know nature to care for and protect it, and to get to know nature you need to go out into it [4–7].

The last 20 years of development have caused a decrease in society members' understanding of key ecological concepts and ecological illiteracy has spread throughout society [8–14]. This is probably due to the reduced contact with nature. To understand the complex causal relation between human systems and nature systems, the understanding of key ecological concepts is crucial [13], but according to research [8,15], these kinds of key ecological concepts are not addressed, for example in Nordic teacher education.

Ecological illiteracy is a serious fundamental problem that is spreading in today's society, as Gregory Bateson pointed out years ago: *"The major problems in the world are the result of the difference between how nature works and the way people think"*. [16] (p. 89). This trend needs to be reversed in some way to re-establish contact with nature and to understand the causal relationship between man and nature, the relationship that forms the basis for sustainability.

The goal in this paper is to open up the discussion on, and find new pathways towards the implementation of, sustainability in education, as research shows that we are not there yet. Educators and education organizers could benefit from this paper, as it suggests new ways of thinking in the transformation of education.

## 2. Method

Literature research methodology can be provided as non-structured qualitative analysis or structured quantitative analysis. The objective of this study is to recognize known problems for the implementation of sustainability in mainstream education in the Nordic countries, identified in recently published research. This study also provides alternative suggestions on how to address problems that prevent the integration of sustainability in education and, therefore, a non-structured qualitative analysis is performed through a traditional literature review. A general literature review has been performed to provide a review of the most important and critical aspects of the current knowledge of the topic. As the purpose of a traditional literature review is to demonstrate a gap or problem in the field, it is a fruitful method to use to approach the problem that the research seeks to address: providing alternative suggestions on how to address problems that prevent the integration of sustainability in education.

Traditional reviews are known to be flexible and can be used to synthesize knowledge beyond research findings, such as theories, practices, and policies. A qualitative analysis of literature has been found to be able to highlight special values in distinguishing past trends and forecasting future models. Therefore, this article is based on a traditional literature review, within existing research in some selected research areas, to provide an overview of the existing research, to identify gaps in the body of knowledge, and to contextualize new approaches to fill these gaps with already existing methods. Within a qualitative research of literature, there is no focus on quantity or the completeness of the material. The focus is

on the interests of the research, with small samples or characteristics of cases and personal literature research. It compares differences and similarities between things through the researcher's reasoning, sums up research, and grasps the rules of things.

This approach has been chosen, as recent research already points out the issues in implementing sustainability in education, but no one has yet found the way forward. The hypothesis that this theoretical article builds on is that an interdisciplinary approach and different pedagogical tools could help in building the bridge towards implementing sustainability in education as well as in society.

### 3. The Sustainability Concept and the Connection to Nature

Sustainable development and the term sustainability are not novel concepts. For quite a long time, they have flourished in a number of different policy documents at the international level [17–20]. However, sustainability has proven to be an intricate concept, not entirely easy to understand and grasp [21].

A common way of describing sustainable development in the West is that sustainable development is a multifaceted and interdisciplinary concept that affects our future through, e.g., cultural, social, economic, political, and ecological aspects in a complex interplay. These different aspects of sustainable development are intertwined and cannot contribute alone in achieving sustainable development [22–25].

In Sweden, the Sámi Parliament [26] has defined *biodiversity* as a prerequisite for all life. It forms the basis for all ecosystem services that are necessary for our existence and wellbeing. Even though we might want to step away from the idea that sustainability and sustainable development are only for biology teachers to teach about, as has been the case in Finnish schools [27], we still need to remember that the basis for all life is nature. That is why sustainability has often been linked to the environmental sciences, even though it is to be understood in a much wider sense, because there would exist no culture, no economics, and no social life without nature [21]. Now, with the era of the climate crisis, we have started to understand that our society is truly dependent on a well-functioning ecosystem. Our ecosystems are dependent on biodiversity and that is the reason why we need to stop the loss of biodiversity [21].

The Swedish Agricultural University (SLU) stated that ecosystem services are part of what we call the nature and cultural heritage. This is how SLU divides and explains the ecosystem services, with examples to facilitate the understanding of the concept [28].

The ecosystems are:

Supply: cereals, drinking water, wood, bioenergy

Regulatory: air purification, pollination, climate regulation

Cultural: outdoor life, health, natural heritage, and tourism

Supporting: photosynthesis, soil formation, biogeochemical cycles

Most of us understand that the ecosystem provides us with wood, fuel, and food. Some of us (probably not all) understand that the ecosystem provides us with service as a carbon dioxide absorber and water purifier. Moreover, what we tend to forget, in our forest clearance eagerness, is that nature and its ecosystems actually prevent the spread of diseases through biological control and provide us with medical resources to cure or prevent diseases [4,29,30]. It is also known that connection to nature can provide humans with an existential experience of wellbeing. Feeling connected to nature can evoke many emotions, such as joy, vitality, and satisfaction—in short, the meaning of life [31].

To perceive the connection between sustainability and the agricultural landscape can be more difficult. The agricultural landscape, with its meadows and pastures, is in its entirety a cultural heritage where land use is closely linked to the diversity of species adapted to the landscape [32]. By protecting the cultural heritage, we at the same time protect the biodiversity and species richness on which a functioning ecosystem depends. Cultural heritage also contributes to creating belonging and understanding of our place in time. It is expressed through cultural heritage, saying something about who we are and

what we have been, where we are and where we are heading [32]. In a changing world, to achieve this understanding could constitute a safe anchor.

The Australian Government's Department of Health states in its webpage: "Being disconnected from your cultural heritage can lead you to question who you really are and where you belong. This may cause you to feel lost and isolated. Connecting with culture can have a positive impact on your sense of belonging and identity—and in turn, on your mental health and overall wellbeing" [33].

These are important factors for our wellbeing, and that is why we need to recognize the services and see the connection between biodiversity, ecosystems, and the culture of how we treat and take care of nature. As air pollution, deforestation, and biodiversity loss tend to increase [34–36] we must recognize that there is a problem in our way of thinking and acting. Here, the traditional knowledge system has a lot to offer mainstream Western society. Aboriginal population groups in South America have for a long time tried to explain that our current problems are caused by our abuse of the sources of Pachamama (the Inca Earth Mother) [37,38].

#### 4. Sustainability and Mainstream Education

Sustainability and education for sustainable development are characterized as holistic approaches [39], but there is research indicating that teachers, at least in Sweden and Finland, lack a holistic understanding of the sustainability concept; therefore, it is almost impossible for them to integrate sustainability in their teaching [39–42]. Wolff et al. [21] argue that there is a need to reorient teacher education if it is not able to generate newly qualified teachers who have developed holistic thinking and a holistic approach to sustainability during their educations.

Recent research [43] reveals that in the Nordic countries, the inclusion of the sustainability concept in education is still quite superficial and addressed more in the political documents surrounding both basic education and teacher education than in educational reality. Jónsson et al. [43] argue that an environmental perspective is often assumed when sustainability education is discussed, probably because when education for sustainable development was first lifted forward in schools, Sweden, Norway, and Finland considered this to be a concern connected to environmental education and environmental sciences. The authors of the report state:

*"It should be evident by now, after several decades of education for sustainable development—decades which have seen increased unsustainability in almost every aspect of human living—that conventional education is rather a part of the problem than a key to solving it. The whole systems redesign for which UNESCO called fifteen years ago has not taken place."* [43] (p. 68)

In 2010, Salonen [44] argued that education for change towards sustainability needs to be based on systems thinking and a holistic understanding of the concept of sustainable development. There is a need for a profound change of the educational system to encourage the understanding of complex systems and their interconnections [45]. Education has been seen as an opportunity for change towards sustainability, but obviously we still have a long way to go. In 2018, Hofman-Bergholm [36] published an article referring to research that highlights the importance of a systems thinking approach in teacher education to be able to graduate newly qualified teachers who can promote education for sustainability. As Cloud [46] states, you can teach about systems thinking without involving sustainability, but you cannot teach about sustainability and sustainable development without involving systems thinking. This frames the importance of the need for teachers to develop a systems thinking perspective to be able to teach about sustainability. However, systems thinking is not a novel concept either; it originated in 1956 by Professor Jay Forrester [47].

This means that we have two concepts dependent on each other: sustainability and systems thinking. We have policy documents that point out important things about sustainability and the importance of a change in educational systems as well as in society. However, we also have identified an issue for the implementation to take place, as it turns

out that we have a reality where it is difficult for those who are expected to follow education policies to connect these concepts themselves and to know where or how to get started with the expected change. Education is highlighted as being in a key position to change people's way of acting and thinking, but there is a lack of a deeper discussion around how to change the current educational system to achieve the desired change in society [48]. These discussions must be lifted to the table for the desired changes to take place.

## 5. Traditional Knowledge and Sustainability

If you take a look around you, you will find that everywhere around us there are traces of our common natural and cultural heritage. They go back and forth; the tracks cross each other or go in parallel, or they grow together into one track. It is like a large fabric that is connected. We are shaped by it, but at the same time we are involved in creating the fabric [49]. Imagine a grazed pasture, a stone fence, an older building, objects from the past, old knowledge, customs, and traditions. All these things are our cultural heritage, an imprint of human activity—a trace of human life and activities. Through the ages, nature and culture have developed in collaboration with each other, and many times, the management of cultural heritage has also benefited biological diversity [32].

*“Indigenous, traditional or local knowledge refers to the knowledge and know-how unique to a given society or culture, which encompasses the cultural traditions, values, beliefs, and worldviews of local people” [50] (p. 5)*

In pre-modern society, almost every citizen had an extensive knowledge about plants and animals and they knew nature's species. To remember and store this knowledge, they used old stories, sayings, interpretations, rhymes, marks, and rules. To survive in a society where nature constituted the major resource, this knowledge was a condition for survival. To predict weather, at a time when survival depended on rain, drought, wind, cold, and heat, folk poetry was a usable tool. Knowledge about how to interpret and read the different signs in nature were conveyed by a tradition of storytelling. Today, many of us probably still remember that we have heard statements about how to read nature, e.g., “when the swallows fly low it will be rain,” but nowadays people have greater confidence in the weather service's forecasts and consider such claims to be oddly curious claims from the past [51].

An important question to think about is what happens to such valuable traditional knowledge in step with an aging generation that will take much of this knowledge with them when they leave their lives on earth and most of the younger generations have switched to gainful employment from agriculture? Children and youth seem to alienate more and more from nature, which has negative consequences, such as the fact that they assimilate little or no knowledge of nature, which has led to a more and more common kind of ecological illiteracy in society [12–14]. This ecological illiteracy, in turn, affects the attitude towards nature in adulthood, which can have a negative impact on the planet's long-term health, as you have to get to know nature to care about it [7].

In a report from the Swedish National Heritage Board [32], there is interesting reading on how cultural heritage can support sustainable societal development. In the report, it is stated that:

*“Cultural heritage helps to create belonging and understanding of our places in the times. This is expressed by cultural heritage saying something about how we are and what we have been, where we are and where we are going” [32] (p. 22)*

If you study aboriginal cultures, different tribes, or old languages you can find a trace of sustainability a long way back [52–54]. In the Nordic countries live the Sámi people, who are an arctic indigenous population group living in Norway, Sweden, Finland, and Russia. Some of them are still living with a deep interaction with nature and they transfer their knowledge to younger generations by traditions through storytelling. They tell stories consisting of their knowledge about local traditions and their living environment. The Sámi word for this traditional knowledge is “árbediehtu.” This traditional knowledge

assumes that man and nature must be considered as a whole. The knowledge consists of cultural, heritage, traditions, and ways of living [26]. Today, the dominant view of ecological, social and health models consists of a Westernized approach, but the fact is that aboriginal population groups, such as Māori or Sámi culture, embrace a holistic approach to ecosystems, where the care for place and landscape is of high relevance as it features a sense of belonging [53,54].

The holistic way of thinking seems to be more common in aboriginal population groups than in mainstream society. Some researchers, such as Herman [55], Tulloch [56], and Wolff [57], argue that the mainstream Western way of thinking today is a result of the scientific revolution and Christianity, dominated by a philosophy where nature is perceived as an object to be controlled by technology. This development through the centuries has led to a disconnection between traditional knowledge, culture, and science, and that is why aboriginal cultures have a slightly different view of the sustainability concept than the mainstream Western cultures, according to Throsby & Petetskaya [58]. There are also shared views of the concept between the different cultures. For example, they share the holistic worldview with an approach that everything is connected in different ways and nothing exists in isolation, but there is a difference in how the holistic systems are characterized by the different cultures. In the Western way of thinking, sustainability consists of connections between major areas, such as macro-economy, society, the climate system, and the natural capital stock, while the cultural aspects are valued and embraced in a completely different way in the aboriginal cultures' perception of the sustainability concept. In the aboriginal perspective, the interconnections in the holistic system are more comprehensive, encompassing other cultural areas, such as language, ceremonies, kinship, and country [58].

Mazzocchi [59] has highlighted the importance of integrating the two different approaches of knowledge systems to understand and find the value in learning from each other. Tengö et al. [60], in turn, claims that if we want to achieve a collaboration between science and different knowledge systems such as indigenous and local knowledge systems, we first and foremost need to change the way we approach the local, traditional, or indigenous knowledge systems. We cannot continue to perceive ourselves as external reviewers of the different systems, writing papers named "scientific studies about . . ." or "scientific studies into . . ."; we now need to change our own point of view, to collaboration through fairly supporting investigations into our shared environmental challenges [60].

Reading through policy documents and scientific articles, it seems that the Western philosophy has at least written down the thought that sustainable development also consists of cultural aspects, both in different policy documents and in research. For example, you can find definitions such as sustainable development as a multifaceted and interdisciplinary concept influencing our future through cultural, social, economic, political, and ecological aspects in a complex interplay [22–24]. However, have we really assimilated the cultural aspects in our sustainability work in real life?

Neither sustainability nor the importance of traditional knowledge is anything new under the stars. Already in the early 1990s, traditional knowledge was recognized internationally as a valuable factor in the striving for sustainable development and for the protection of biodiversity [61]. The United Nations stated in 1992, in Article 8 of the Convention on Biological Diversity, that we should "respect, preserve and maintain knowledge, innovations and practices of indigenous and local communities embodying traditional lifestyles relevant for the conservation and sustainable use of biological diversity . . ." [62]. This shows that the importance of understanding traditional knowledge systems has been known for many years, but according to Campbell [63] it was not before now that we have started to understand the importance of traditional knowledge systems. For example, there are calculations showing that aboriginal cultures around the world preserve and guard about 80% of global biodiversity. In this context, one needs to know that aboriginal cultures manage only about a quarter of the world's land surface and yet they manage to guard almost all of the plant and animal species in the world, a biodiversity that all humans are

dependent on in the form of, e.g., food systems and the medicines it supplies us with. Even though this appears to be quite obvious, Western society has denied the aboriginal cultures' longstanding fight against climate change, land degradation, and deforestation until quite lately. Now, there are international organizations acknowledging the significance of the fight advocated by aboriginal cultures [63].

As stated in the UNESCO report on Intangible Cultural Heritage and Sustainable Development [64]: "Traditional knowledge, values and practices accumulated and renewed across generations as part of intangible cultural heritage have guided human societies in their interactions with the surrounding natural environment for millennia. Today, the contribution of intangible cultural heritage to environmental sustainability is recognized in many fields such as biodiversity conservation, sustainable natural resource management and natural disaster preparedness and response." [64] (p. 6).

It is the cultural traditions, values, beliefs, and worldviews of local people and their knowhow that are unique to a given society and that need to be transformed as traditional knowledge.

## 6. Storytelling as a Tool in a Transformative Learning

Storytelling is used by indigenous people to transform traditional knowledge [26] and as a meaning-making activity [53].

*"We are totally dependent on our land. Without the river we would have no fish, without the marshes we would have no ducks, without the mishkodi we would have no medicines, without the beauty of nature we would have no peace. The land is our soul"* [65] (p. 244)

This is a quote from an old female respondent in a research interview performed by Beckford et al. [65]. They performed interviews with officials of the Walpole Island Heritage Center to examine different cultural aspects of environmental stewardship and sustainability. This quote shows evidence of knowledge about systems thinking and it states an example of how traditional knowledge, biodiversity, and sustainability are connected. This quote could also be seen as an abbreviated part of a short story that could be told to children to develop an early understanding of systems thinking. Storytelling is a way to make facts understandable and easily accessible [66].

Stories have been a part of our history from time immemorial [67,68]. As social beings, our brains have evolved to interpret our experiences using stories as a framework. Stories are, in themselves, emotional social experiences. Using stories, or storytelling, as an educational tool helps us to deliver knowledge content with a context. If you deliver knowledge content that has no context, that knowledge content tends to pass many by instead of putting it in a context within which the knowledge recipients can relate their own experiences [69].

As soon as you hear something told in the form of a story, you become interested [66,70]. That tells us that scientists who master storytelling, in the way that Hans Rosling [71] did, for example, can spread facts about science in a way that makes people listen and remember. If you, as a researcher or teacher, only line up lots of facts in a presentation, it is quite ineffective in the sense that you want the audience to absorb, understand, and remember the facts. There must be something the audience recognizes and can refer to; they should be affected and there should be emotions [66,70].

According to Jack Mezirow, one can define transformative learning as a process through which we change the frames of reference we take for granted (meaning perspective, sensory habits, ways of thinking) and make them more inclusive, open, emotional, capable of changing, and reflective, so that they can generate beliefs and opinions that will give more true or motivated actions [72]. Transformative learning has proven to be very demanding and strenuous and occurs only when the learner is in a situation where there is no other way out that he or she can perceive as sustainable. It is described as follows: "every learning that involves a change in the learner's identity" [72]. Ostrow Michel et al. [73] describe the connection between transformative learning theory and education for sustainability. The authors highlight the power of transformative learning to

educate engaged and sustainability-conscious society members. Transformative learning is necessary in managing to take a step away from the kind of education that is most common in higher education today, which often consists of information transfer without challenging the beliefs or assumptions of the learner. A desirable effect of transformative learning would be to induce students to look at things differently [73].

In a UNESCO paper published in 2019 [74], storytelling is highlighted as a possible pedagogical tool for use in classrooms to promote transformative engagement. It stated that reflections on life stories of others leading to transformative engagement in themselves is an opportunity for learners, as the storyteller can provide the learners with powerful role models. Taking part in stories of personal striving and inner struggles can help those who listen to build their own values and principles. Reflective discussion in the classroom on the challenges and the life choices shown in stories relevant to current issues can deepen learners' understanding and critical thinking [74].

David Thurfjell [75], a Swedish historian of religion and professor of religious studies, found traces of cultural echoes when he interviewed Swedish forest walkers. Analyzing the in-depth interviews, Thurfjell [75] found signs of a possible ecological turn, meaning a transformation from the anthropocentric orientation that has been the leading approach for a millennium. The respondents' views on nature possessed traces of a kind of devotion to nature that has developed since pre-Christian times and the respondents showed an interest in political commitment to nature's resources. According to Thurfjell [75], these kinds of existential deep experiences, arising through forest walks, are not insignificant even though they take place far from the economic and political arena where transformation is needed for a transformation of the society, because these kinds of experiences can slowly affect the worldview of the experiencer, which is something Ostrow Michel et al. [73], among others, ask for.

New research reveals that systems thinking is seen as helpful in understanding complex systems, but a combination of case studies and systems thinking, or system dynamics simulation, has been shown to increase ESD learning outcomes [76,77]. The now deceased scientist Hans Rosling was phenomenal at making computer simulations of statistics and telling inspiring stories to increase the understanding of various world problems in his audience. In 2005, he founded the foundation Gapminder with the goal of combating devastating ignorance with a fact-based worldview that everyone can understand [71,78]. After his death in 2017, Rosling was highly recognized in public as a storyteller who redefined the role of visualization when presenting statistics or other data. He did not present statistics or numbers to illustrate a story; no, he told the stories that the numbers forced him to tell. He did this to bridge the gap between academic and public discourse, arguing that if science and research are to be useful at all, this gap needs to be filled. Researchers need to try filling the gap, especially when it comes to social sciences. It is the researchers' fault that there is a lack of popular knowledge about research, not the public's fault [78]. The Royal Statistical Society [79] wrote that "*Hans was a storyteller; he turned statistics into a performing art*".

In his research, McNett [69] investigated how stories can facilitate learning. He presented, among other things, the following purposes for storytelling that can be applied in schools:

- Capture students' attention and entertain;
- Engage students through surprises or excitement;
- Personalize the narrator, improve the classroom atmosphere, and/or reduce stress and anxiety;
- Facilitate understanding and adapt content;
- Associate a theme or concept with a story;
- Facilitate problem solving;
- Communicate facts in a more accessible way;
- Connect a wide range of concepts;
- Provide unique or underrepresented perspectives; and

- Present a problem or dilemma [69] (p. 190)

To understand and see the connections as advocated within the systems thinking theory [36] it might be useful to use both visualization and storytelling to make people aware of the connections. In *The Oxford Textbook of Nature and Public Health*, published in 2018, you can find a figure at page 235 showing a schematic representation of the paths by which climate change, forest clearance, agricultural activities, and changes in patterns of human density and mobility influence—separately and together—the risks of difference categories of infectious diseases. Here, deforestation is directly connected to the displacement of bats into human settlements, which in turn might lead to human contact with novel bat viruses and an emergence of new viral diseases.

Now, in 2022, we can all relate to that through the spread of COVID-19. This should make it quite obvious why we should listen to both indigenous and the scientific warnings about the effects of climate change, but also that research outcomes should be translated into popular knowledge to reach the general public.

In an Assessment Report 5 (AR5), in 2014 [80], the Intergovernmental Panel on Climate Change acknowledged the importance of indigenous peoples' contribution in the adaptation to climate change: "Indigenous, local and traditional knowledge systems and practices, including indigenous peoples' holistic view of community and environment, are a major resource for adapting to climate change, but these have not been used consistently in existing adaptation efforts. Integrating such forms of knowledge with existing practices increases the effectiveness of adaptation." However, Magni [50] argued that other than recognition, there has been very little done by the international community to integrate indigenous peoples and their knowledge into climate change strategies and in decision-making processes.

Hawkes argued in 2001, in his monograph "The Fourth Pillar of Sustainability: Culture's Essential Role in Public Planning" [81], that a cultural framework operating in parallel with social, environmental and economic frameworks is essential to achieve a sustainable and healthy society. Culture should be recognized for its key role in expressing the meaning, identity, and purpose of our society and its citizens. Quite recently, UNESCO [82] has started to highlight that the focus in education is about to shift, "from a focus on access to education to a focus on quality and with that, relevance." Traditionally, access to education has been a development indicator, but there is data showing that students are not necessarily learning when they are in school, which is why a shift towards quality and relevance is needed. It is also recognized that formal education could play a valuable role in safeguarding the intangible cultural heritage when shifting towards relevance.

## 7. Discussion

Based on the first chapters, it is understood that cultural heritage, natural heritage, biodiversity, and ecosystem services are interconnected. Suddenly, you realize that, in many ways, they also touch on the concept of sustainability. Although sustainability as a term is relatively new, one can trace the sustainability concept far back in original cultures by studying ancient cultures and languages from different population groups. For example, in Västerbotten in Sweden, the indigenous Sámi people have a tradition to transfer their knowledge of their way of life in interaction with nature, knowledge of their living environment, and local traditions to the next generation through narration or storytelling. There is a Sámi word for this Sámi traditional knowledge, "árbediehtu." "Árbediehtu" is seen as a collective knowledge that the Sámi carry with them and it consists of knowledge of heritage, traditions, customs, and lifestyles. Västerbotten possess a solid cultural heritage, but also a natural heritage. The Sámi, like many other indigenous peoples, believe that biodiversity is a prerequisite for all life on earth and forms the basis of the ecosystem services that are necessary for human existence and wellbeing. Cultural heritage can support sustainable societal development, mental health, and overall wellbeing, as knowing cultural heritage has a positive impact on the sense of belonging and identity.

It would be of great importance to integrate the two different approaches of existing knowledge systems to understand and find the value in learning from each other. The culture of storytelling and the way it is performed by indigenous people should be adapted on local traditions and in mainstream education, to reconnect to such fundamental values that older cultures can convey in relation to nature and culture.

Transformative learning means learning that makes a difference in the individual's behavior, in the learner's actions in the future, and in attitude and personality, which is the kind of learning urgently needed for a turn towards a sustainable future. Just as the United Nations Educational, Scientific and Cultural Organization (UNESCO) stated, in 2017 in its "Global Action Program on Education for Sustainable Development—Future Forward," where education is lifted forward as the key to transforming whole societies towards sustainability:

*"Sustainable development can be achieved but technological solutions, political regulations or financial instruments are not enough. Long-term sustainable development can be achieved only if individuals and societies change the way they think and act. Education is key to achieving this transformation."*

Education, transformation, and sustainable development are key words dominating this and many other policy documents [21,40,43]. However, it is still the fact that "The whole systems redesign for which UNESCO called fifteen years ago has not taken place." [43] (p. 68). For example, there is research claiming that Finnish teacher education has failed in sustainability [21], and there is research highlighting systems education as a foundation for a possible way of working towards a sustainable future [36], but research reveals that at least Nordic student teachers do not know much about systems thinking [15]. If teacher education in a country like Finland, with its reputation for having the best education in the world [21], does not manage to teach the student teachers how to use systems thinking and ignore sustainability, then we must admit that we have serious problems. A change towards sustainability is not possible without a change in the system of teacher education [21,36]. The world has changed quite rapidly and the perception of the world is quite different for the generation growing up right now than it was for earlier generations. New skills and abilities are important to develop for youth to manage living in the different and unknown culture of today [48]. They need to develop a different way of seeing the world around them, as transformative learning could contribute with.

This means that something more is needed in addition to educational policy documents. It is not enough to write the word "sustainability" in a curriculum of basic education [43] and other policy documents at different levels, both nationally and internationally. The teachers and their teaching seem to be of great importance. However, if teachers lack knowledge in transformative learning and lack a holistic view of the concept of sustainability and the systems thinking it is based on, it would be highly important that universities that host teacher education programs address these issues and take responsibility to transform the education of teachers [15,21,36].

So why is sustainability still not integrated in education, after decades of discussions, agendas and political commitments? There are some main obstacles that need to be addressed. First and foremost, sustainability is an intricate concept. Here, it would be a good start to embrace Rosling's endeavor to bridge the gap between academic and public discourse, because teachers need to know what they are supposed to teach about. Popularizing knowledge about sustainability and developing tools for teachers so teachers themselves understand how the system works and how to use the tools of systems thinking and storytelling in their teaching towards a transformative learning should be seen as extremely important. If you present facts both visually and by telling a story, even youths and children can absorb the facts, remember them, and hopefully start acting on them.

A reconnection to both nature and culture has been lifted forward by many researchers, as required for a sustainable future. Systems dynamics, systems thinking, and storytelling could serve as useful tools for an education under change towards transformative learning. Several UNESCO policy documents acknowledge the importance of traditional knowledge

and the intangible cultural heritage. It is the cultural traditions and values of local people, and their knowhow, which are unique to a given society, and which should be transformed as traditional knowledge. Here, formal education is lifted forward and recognized for its valuable role in safeguarding these traditions and cultural heritage.

In a changing world, knowing your culture and where you come from can feel like a safe anchor. We need a confident base in the rapidly changing world to not feel rootless. We can look back to reconnect with traditional knowledge systems and we need to look inside to challenge our beliefs and the contemporary ways of living and acting. Disconnection from nature, loneliness, and feelings of having no purpose could be reversed towards finding meaning and an enhanced sense of identity by embracing the fundamental values that can be found in traditional knowledge and intangible cultural heritage.

In some way, my old and very wise grandmother managed to teach me the basics of systems thinking, without knowing there was a name for it in science. My grandfather taught me the importance of biodiversity and ecosystem services, and every time I feel a bit down or resigned to challenges, I close my eyes and return to my childhood and the kindness of my grandparents and the whole small village which had a culture in which people did not hesitate to help others in difficult times. Knowing your background and where you come from, your culture, brings a secure sense of belonging and makes it possible for you to have the courage to challenge your assumptions and beliefs, and in the long turn start your transformation towards seeing and doing things differently, which are crucial for a sustainable future.

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