

# Chapter 15

## Education as a Driver of Extinction of Experience or Conservation of Biocultural Heritage



Alexandria K. Poole

**Abstract** The concept of extinction of experience has increasingly garnered attention in environmental education literature. “Extinction of experience” (EoE) is a neologism articulated by nature writer and lepidopterist Robert Michael Pyle to capture the somewhat intangible loss that occurs when biodiversity is removed from key experiences in our daily lifeworld, and it refers to the cultural and experiential loss that ultimately occurs following the abstention of nature experience. In this paper, I introduce Pyle’s landmark concept and propose that it has significant implications as an additional indirect driver within formal education. With the increasing loss of local species, the rapid extinction crises, and the impacts of climate change shifting ecological systems, there is significant loss and disruption of ecological communities. I argue that EoE is an indirect driver of biodiversity losses. Within formal school settings, knowledge of biodiversity losses and knowledge to co-exist with biodiversity in sustainable ways are not adequately addressed. Therefore, formal education contributes to losses of local ecological knowledge and nature experiences and undermining biocultural heritage. To reverse this trend, it is necessary to identify key mechanisms within formal education that can serve as drivers to protect, promote, and engage biocultural heritage. This approach can also be applied to consider ways to remediate processes that would otherwise drive EoE within dominate practices in our society for biocultural conservation.

**Keywords** Formal education · Informal education · Environmental education · Conservation · Indirect drivers · Urban

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A. K. Poole (✉)

Faculty of Behavioural, Management and Social Sciences (Philosophy), University of Twente, Enschede, The Netherlands

e-mail: [a.k.poole@utwente.nl](mailto:a.k.poole@utwente.nl)

## 15.1 Introduction: The Need to Address the Extinction of Experience Within Formal Learning Experiences

The concept of extinction of experience has increasingly garnered attention within environmental education and related fields concerned with conservation of biodiversity, culture, or language, and their interdynamics such as conservation biology, ethnecology, and biocultural conservation. A neologism articulated by nature writer and lepidopterist Robert Michael Pyle (1978) to capture the somewhat intangible loss that occurs when biodiversity is removed from key experiences in our daily lifeworld, extinction of experience (EoE) refers to the cultural, psychological, and personal lacking that ultimately occurs following the abstention of nature experience. The complex relationships that humans share with nature in everyday life in relation to the form of engagement, of course, depends upon the technologies, access, and habits that those communities have with the non-human world. However, the concept has been adopted by practitioners ranging from urban environmental educators to indigenous movements.

There are many vectors which influence the ways in which we engage the world, including agriculture, economy, landscapes, information technologies, media, and education. When these systems drive us away from engagements with the natural world and the ecological systems that produce food, air, water, and the rich biodiversity of life, human cultures can become unaware of biodiversity losses, and ecological disruption follows. This is perhaps most striking in the climate change denial movements seen in the USA. This denial of climate change and biodiversity losses has profound consequences if it becomes permanent because species and nature experiences will be impossible as they disappear entirely.

In this chapter, I discuss the concept of “extinction of experience” which refers to the corresponding experiential loss occurring as a result of this significant disruption of ecological systems (Randall 2009; Lawler et al. 2006; McKinney 2006; MA 2003; Poole 2015) and the experience of the absence the remains behind (Pyle 1993, 2001, 2014). I propose that EoE is an indirect driver of biodiversity loss. The lack of knowledge about this loss and the loss of knowledge to co-exist with biodiversity in sustainable ways exacerbate biodiversity losses. Classically expressed in terms of local ecological (LEK) or traditional ecological knowledge (TEK), the significance of the loss of the deep ecological knowledge for sustainability and environmental ethics needs to be understood for maintaining sustainable societies (Berkes et al. 2000). Therefore, vectors that control spaces in which knowledge, engagement, and experience of nature are drivers of EoE that should be acknowledged in education. This is particularly important as we engage new innovations to address climate change and sustainability innovations such as artificial intelligence, synthetic biology, geo-engineering, and other socially disruptive technologies that have the potential to greatly shift cultural and ecological systems.

The loss of nature experience impacts cultural, psychological, and ethical aspects of ecological knowledge and will further exacerbate the loss and disregard for biodiversity and ecological deterioration within culture and values (Kimmerer

2002; Berkes et al. 2000; Miller 2005; Orr 1996, 2004). Emerging literature on the extinction of experience has focused on urban environments and citizen science, often overlooking the importance of agrarian communities and indigenous interrelations with nature. These communities also experience EoE in unique ways that should be understood and recognized. In this chapter, I articulate ways in which formal education and spaces of learning and knowledge transmission can remediate EoE across the urban-rural gradient by recognizing the role that biocultural heritage and local ecological knowledge play in understanding a sense of place. To address this anthropogenic gradient, I discuss the EoE concept in terms of biocultural heritage; that is, in the context of its interrelation to the culture, language, and biodiversity of the complex landscape in which human-nature relationships take place and methods to remediate these trends within education (Gavin et al. 2015; Poole 2018).

The book chapter introduces the section on education for the fourth volume of the Springer *Ecology and Ethics* series “Field Environmental Philosophy: Education for Biocultural Conservation.” By discussing the implications for education, I hope to focus on education policy as a driver for change and ways we may protect our communities in systematic ways for environmental values, our relationships to nature, and capacity to better cultivate our role in sustainability cultures.

## 15.2 The Extinction of Experience Cycle as an Indirect Driver of Change: Learning from Where We Live

Misleadingly, urban spaces and the built environment are often presented as vacant for nature experience, largely because of the dominance of technology, and the prevalence of weedy or unwanted vegetation (Poole 2019; Colléony et al. 2017). On the one hand, when nature is present, a common argument is that it is highly managed, often considered to be a simulacrum of true complex “wild nature,” an impossible version of the complexity of biodiversity, and therefore, a false image of the much larger natural world beyond the city. On the other hand, the nature that is present is often exotic, or ornamental, but rarely the native or endemic species that originally occurred in the region. How then, does the urban dweller gain experience of the natural world, or an understanding of its workings? And as more and more of the human population moves to urbanized settings, what is the overall impact of these settings on the environmental consciousness of human cultures and values?

The first use of the term “extinction of experience” appeared in Pyle’s short essay originally printed in the popular magazine *Horticulture* (Pyle 1978). Pyle’s inaugural introduction of the concept argued that the loss of *opportunities* of experience can have irreversible consequences for knowledge and care of nature as a personal experience, and even as a cultural phenomenon. Further, this lacking exacerbates trends to reduce local instances of biodiversity through management practices,

continuing a cycle of biodiversity loss as the losses becomes unnoticed, because community members lack the knowledge to note the absence.

The majority of extinctions involves not the eradication of species on a global scale, but the disappearance of portions of them wherever we look. A colony goes extinct here, a subspecies drops out there—two varieties of butterflies vanish from the High-line Cana. They add up, and the consequence is a drastically undermined flora and fauna. It seems to me that the impact of these partial extinctions upon our natural base and collective psyche, as well as our ability to withstand future assaults on the environment, are very grand indeed. In the long run they may affect more of that than will the disappearance of entire species. For what these local extinctions represent is the loss of opportunities—the extinction of experience (Pyle 1978, p. 56).

So it goes, on and on, the extinction of experience sucking the life from the land, the intimacy from our connections. This is how the passing of otherwise common species from our immediate vicinities can be as significant as the total loss of rarities. People who care conserve; people who don't know don't care. What is the extinction of the condor to a child who has never known a wren? (Pyle 1993, p. 146–147).

In the second iteration, *The Thunder Tree: Lessons from an Urban Wildland*, published almost 20 years later, Pyle (1993, 146–147) tells the story of the moment he discovers that a beloved woodland has been cut down for a parking lot. Here he describes this personal and intimate moment when his sense of place is also harmed, as it is not only species that are displaced, but an entire biotic community. Pyle's emphasis is that an extinction of experience can occur when opportunities for engagement are lost, whether it be a physical or conceptual barrier, or the physical disappearance of an endemic species, that is, the absence of its *local* presence (as opposed to an extinction wide event). Pyle argues that EoE is caused by loss of individual experience of biodiversity in one's own neighborhood. The young, elderly, poor, or disabled are particularly vulnerable to local biodiversity losses as they do not have the capacity to move beyond their home range to seek out nature experiences. While the loss of local biodiversity has evolutionary and ecological consequences, it has experiential consequences for the human community, too: "a different type of depletion," because "the loss of neighborhood species endangers our experience by nature" (Pyle, 1993, p. 260).

Pyle's initial definition regarding the extinction of experience clarifies the difference between (1) an actual extinction and disappearance of the thing itself, so that no experience of it is possible, and (2) the loss of certain lifestyle practices or habits or types of engagements which allow for the presence or absence of an experience with that thing. In the case of biodiversity extinction, our range of experiences with a species might change depending on its physical presence in a particular region, or a change in our habits to such an extent that we do not engage that being. It is important to explicitly add the justice dimension that biodiversity is being exterminated and landscapes decimated. Further, this becomes a self-perpetuating cycle as experiences with nature diminish and understanding and emphasis on nature decrease, exacerbating the tendency to create conditions in which nature experiences are unlikely. This estrangement has become so systematic that after lasting beyond two generations Peter Kahn described the cultural loss as a kind of "environmental

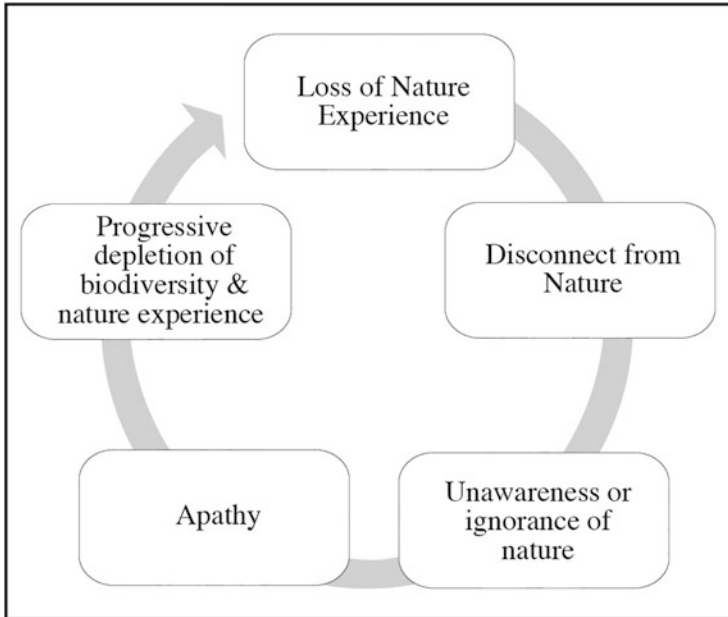
generational amnesia” in which “children who know about pollution in general and live in a polluted city [are] unaware of their own city’s pollution” (Kahn and Kellert 2002; Kahn 2002).

What Pyle’s discussion shows is that urban and built environments are not biodiversity deserts, but complex spaces where engagement with nature and natural wonder is indeed quite possible. However, ecological literacy and understanding of the environment along urban-rural gradients and associated complex ecological knowledge systems, will be undermined without proper educational support. Additionally, these experiences are tied to ethical and emotional associations with nature, as learning is not an ethically or emotionally neutral process (Pyle 1993; Leopold 2004; Kahn and Kellert 2002; Noddings 2013; Callicott 1987).

Environmental education requires an understanding of landscape and place as educational spaces, in which a human community learns about the non-human world. Michael J. Samways (2007) citing Miller (2005), drew attention to this and proposed that urban society lives on the edge of the “real and virtual world.” Samways and Miller popularized Pyle’s EoE concept within conservation biology and environmental education. There is a surprisingly diverse use of this term across conservation, ethnoecology, environmental education, and even within popular culture blogs and magazines (Maffi 2001; Miller 2005; Stokes 2006; Soga and Gaston 2016). Considering the term’s deictic usage, it can generally be understood to refer to the abstention of experience with complex nature, the reduction of green spaces, biodiversity, or non-human life. Pyle (2003, p. 206) described EoE as an “inexorable cycle of disconnection, apathy and progressive depletion” (Fig. 15.1). —Pyle’s cycle of EoE is spiraling as opportunities for positive experiences with an intact nature are lost, and its presence in urban or consumer life discounted. Because of this, Pyle urged us to remember that any natural experience can be life changing, and that even the smallest and most “humble” habitats can fulfill the role of awakening a child’s care for the environment.

Pyle (1993, p. 262) emphasizes that “[t]he extinction of experience is not just about losing the personal benefits of the natural high. It also implies a cycle of disaffection that can have disastrous consequences.” Hence, EoE self-perpetuates; this is a point that is vital for environmental education, and education more generally. Pyle points out that nature conservation is not only about beneficial experiences a child might have with nature, but is also key for the conservation of biodiversity itself. Consequently, we should ask two pedagogical questions: How can we conserve these experiences? How can we protect the body of knowledge that reflects these fundamental experiences?

While never presented by Pyle as a philosophically developed theory, the extinction of experience (EoE) has remained a device used by environmental educators and conservationists to describe this social phenomenon of experiential loss. This concept has gained popularity in use by the general public as well, appearing in public lectures and inspiring Richard Louv’s “No Child Left Insides” social movement in the USA and expressed in House Bill “No Child Left Inside” which has been proposed numerous occasions, though an iteration has yet (2022) been made into law (Sarbanes 2022; ACA 2015). This concept is a particularly significant because it



**Fig. 15.1** Robert Pyle's cycle of extinction of experience. Modified from Pyle (2003)

illuminates a phenomenon occurring systematically within urban and educational communities. Consequently, I propose that if left unaddressed, the EoE cycle may continue to self-perpetuate as a hidden phenomenon impacting societal values, cultures and underlying the loss of biodiversity (Poole 2015).

EoE involves at least two factors: (1) the degree to which a community cares for the well-being of non-human entities and (2) the ecological knowledge the community has to ensure the integrity of that ecosystem (Poole 2015). EoE certainly seems to impact both aspects of engaging with ecological systems. Each of these senses raises important questions about ethical and ecological literacies within environmental ethics and biocultural conservation. Not only should we be concerned about the well-being of the ecological systems, but we must maintain the ecological knowledge that is needed to be good environmental stewards. This of course raises further questions as to what ethical obligations we have within our educational systems to teach about our local ecosystems—how much knowledge should we have about our local, regional, and global environments, and about our local habitats? Who should be teaching this knowledge? Should it be taught in the local languages of the people? Whose intellectual property is this knowledge?

Consequently, EoE is a potential driver within education and other institutional processes that erodes experiential, cultural, and linguistic knowledge and understanding of the natural world, and therefore the human embeddedness with the non-human world. This is particularly pressing for cultures and identities that conceive of themselves as part of nature or inseparable from the natural world,

because their ways of being in the world are disrupted, undermined, or alienated. Their memory, culture, and knowledge of those ways are being lost as well. This will be discussed next in the context of the extinction of experience cycle as a driver within formal education and environmental education.

### 15.3 Formal Education as a Driver of Extinction of Experience and Biocultural Homogenization

There are many drivers of EoE, and a central one is formal education (Poole 2015; Pyle 1978, 2001, 2002; Miller 2005; Nabhan and St. Antoine 1993; Soga and Gaston 2016). With its standardized methodologies, languages, and content, formal education has two outcomes that drive EoE and are problematic for biocultural conservation. First, it creates the conditions for EoE, as outlined in the previous section: (a) that is the loss of knowledge of local species; (b) experience with them; and (c) awareness of these losses. Second, what philosopher and conservationist Ricardo Rozzi (2013) has called *biocultural homogenization*. These two dynamics will be elaborated in this section.

The EoE cycle within education disconnects the transmission of intergenerational knowledge and linguistic knowledge within cultural groups, damaging their linguistic and cultural knowledge, further detaching them from their sense of place. This detachment is becoming a standardized process that is recreated as a systematic and monocultural process (Poole 2015; Rozzi 2013; Pretty et al. 2009). The loss of cultural heritage—and respectively the cultural sovereignty of distinct groups—is a major contributor to environmental degradation and incidentally the creation of poverty more generally further exacerbating these dynamics (Escobar 1995; Hunn 2007; IPCC 2009; Maffi 2005; Posey and Dutfield 1996).

Jules Pretty et al. (2009) identified significant threats to both cultural and biological diversity, including: (1) resource use by new commercial sectors such as biofuels or timber industries; (2) extended commodification of natural resources; (3) immigration of new economic actors into long-standing community structures. The list also includes important drivers that influence values and spaces in which communities live, such as (4) the aspirations of consumer lifestyles worldwide; (5) the continuing globalization of food systems; (6) urbanization and rural to urban migration trends (though there are notable reversals of these patterns); (7) modernization of healthcare; (8) language erosion and loss; (9) assimilation, and (10) homogenization of formal education and the expansion of dominant belief systems.

The role of formal education driving erosion of local languages and local ecological knowledge is clearly documented. Stanford Zent, a US-Venezuelan ethnobiologist, explores the social dimension of biocultural experience and transmission of knowledge. In a UNESCO report on “delearning trends and changing patterns of [knowledge] transmission,” Zent (2009) argues the importance of local

participation and engagement within learning patterns. Synthesizing many studies, Zent focuses his report on the knowledge transmission of learning (or delearning patterns) within indigenous communities, as influenced by Western pedagogical practices, by reviewing case studies in multiple countries. From this synthesis, he concludes that traditional patterns of knowledge transmission are usually “informal, context-dependent, activity-situated and participatory in nature” (Zent 2009, p. 51). For instance, in Venezuela, when a mission institutionalized formalized education structures, such as indoor classroom environments or structured recess, children were less likely to participate in traditional, local-based activities with the environment (Ishizawa 2006). These students demonstrated less local ecological knowledge and less interest in their traditional community practices. Zent (2009, p. 51) reports that:

According to our experience of Jotí daily life, most talk about plants occurs in contexts in which there is direct contact and interaction with them. These include: walking through the forest, harvesting plant products, processing or eating the catch, painting the body with vegetable dyes, performing rites with magical plants to enhance hunting success, curing the sick, etc. We did not witness formal or consciously planned teacher-led instruction about plants, with the exception of one of the schoolteachers at Kayamá who decided to teach his pupils about plants after we completed our study and then informed the community of the gap between children’s and adult’s knowledge on the subject. *Only when children asked questions first* to parents, older siblings or other caregivers, usually in the course of subsistence activities, was specific and directed verbal instruction provided. In that sense, we would characterize ethnobotanical knowledge transmission among Jotí as *learner initiated or motivated*: information is verbally transmitted from expert to apprentice upon the latter’s request.

The importance of knowledge transmission being “learner initiated or motivated” and taking place during day-to-day activities within the community emphasizes two aspects often missing within formal educational structures. First the local contact with biodiversity and emotional engagement is missing, and further, the absence of connectivity with the community’s day-to-day priorities creates a gap between the student and the world in which they find themselves as subsistence ways of life are replaced by neoliberal economies. These two dimensions are not only missed in formal education, but also within informal education and the prevalent of cell phones and digital media that mediate experiences today (Zent 2009, p. 51).

In an earlier study exploring the loss of cultural ecological knowledge from one generation to the next, Gary Nabhan and Sara St. Antoine (1993) compared the inter-generational knowledge of O’odham and Yaqui tribal elders and schoolchildren of the US/Mexico desert borderlands. The elders and schoolchildren were two generational groups who had considerably distinct environmental experiences. This resulted from changing technological, environmental, and educational conditions, including habitat degradation, loss of oral traditions, and loss of visceral contact with local flora and fauna, meaning that the younger generations suffered a significant “extinction of experience” (Nabhan and St. Antoine 1993, p. 235). The tribal elders, “who have engaged in considerable hunting and gathering activities during their lifetimes” had different ethnobiological knowledge than “. . . their grandchildren who



have grown up fully exposed to television, prepackaged foods, and other trappings of modern life” (Nabhan and St. Antoine 1993, p. 231).

Nabhan and St. Antoine (1993, p. 241) further observed, “[n]ow that global electronic media dominate knowledge of nature, these children are losing the kind of local awareness that television documentaries cannot supply.” Their analysis demonstrated that children were losing local knowledge of their desert surroundings. They found that children did not know that birds sang more frequently in the morning than at dusk, that it was possible to eat the fruit from the prickly pear cactus, or that the creosote bush was the fragrance that carried in the wind so strongly. Further, children were unaware of a major food source, the prickly pear cactus, despite its popularity in the region for over 8000 years and though it continues to have a strong presence in markets in the area. Their analysis also emphasizes that one of the major distinctions in the types of learning that children are undergoing is that television and similar passive learning does not require the child to engage their surroundings; they just “sit and absorb,” . . . “[b]oth television and certain formal education approaches run counter to the ways of indigenous education—for example, apprenticeships with elders—that have been more successful in previous generations” (Nabhan and St. Antoine 1993, p. 241). Nabhan and St. Antoine call this trend the “demise of the oral tradition.” It is important to note in the discussion of EoE that this dimension is often overlooked. Not all knowledge of the environment is equal. Personal, cultural, and psychological connections provide different connections to biodiversity, ecosystems, and what might generally be understood as nature.

The loss of local ecological heritage and local ecological knowledge occurs in myriad ways, many of which are intentionally directed by particular agents (certain traditional practices cease and are replaced by a new ethical view, for instance). Since these losses are often obscured and made invisible, they are discounted even as their physical experience is threatened, perpetuating the slow erosion of the capacity to recognize this loss (Nabhan et al. 1996; Orr 1992). The loss of such sensitivity unravels thousands of years of deep co-evolutionary adaptation of humans to their surrounding world, in its living, thriving culture. Examples of acculturation practices include the reduction of the number of languages spoken and the standardization of textbooks and content to represent one cultural worldview.

This tension has also been identified by conservationists as the difference between monoculture and polyculture systems (Shiva 1993; Ishizawa 2006). These tensions between these systems have far-reaching implications for policy and institutional practices. These cultural and institutional structures also influence cultural memory, sense of place, imagination, and appreciation. Therefore, we need to develop an understanding of the underlying causes of such experiential disconnect from knowledge and to comprehend this loss within the complex interrelation that culture shares with biological diversity and the environment as a co-evolutionary aspect of this dynamic. In this case, in order to redress EoE, it is necessary to revise the internal mechanisms within formal education.

By comparison, schoolchildren in the USA are unable to recognize basic plants of their region, though they have a high incidence of product recognition (Louv 2005,

2021). In rural communities, rural migrations have been taking place as younger generations move to cities. For many living in urban environments, local extinction of species or environmental degradation remains unknown or unobserved (Wandersee and Schussler 1999; Miller 2005; Samways 2007). Additionally, especially among indigenous communities, oral traditions become lost (Maffi 2005; Rozzi 2012; Berkes et al. 2000). Informal educational praxis of learning from family, participating in community events and home-economic activities are discounted. In this sense, EoE should be recognized as reiterative process that can become embedded in institutionalized systems if it is not intentionally addressed.

I call attention to the fact that these trends in formal and informal education are exacerbated by standardized institutions, such as industrial agricultural systems and market economy practices. Not only does daily engagement with biodiversity decrease, but the knowledge about these systems is disregarded in practice as well. This standardized urban experience implies a deprecation of engagement with local biodiversity and local knowledge. Nabhan (2001, p. 145) criticized this trend by stating that a prevailing approach in the West is the attempt “to gain insights about the natural world from indigenous peoples, treating them as ‘native ecologists’ whose traditional ecological knowledge is worthy of respect.” However, dominant educational systems still disregard local ecological knowledge, even though in theory this knowledge is often considered important in conservation and sustainable management.

The importance of knowledge transmission being “learner initiated or motivated” and taking place during day-to-day activities within the community emphasizes two aspects often missing within formal educational structures: (1) the local contact with biodiversity and emotional engagement, and further, (2) the absence of connectivity with the community’s day-to-day priorities. The latter, particularly affects indigenous and other local communities because it creates a gap between the student and the world in which they find themselves as subsistence ways of life are replaced by neoliberal economies. These two dimensions are not only missed in formal education; they are missed also within informal education driven by a growing prevalence of mediated experiences (Rozzi 1999, 2013).

For example, an insightful analysis of Chilean textbooks and recreational books by Juan Luis Celis Díez et al. (2016) found that only 7.6% (83 out of 1095) of the children’s books depicted native fauna. Additionally, books depicted mostly exotic plants and foreign wild landscapes or natural scenarios. Of animals represented, 72.7% were exotic to Chile. Educational or formal institutions that discount the importance of local ecological knowledge undermine cultural integrity and biocultural heritage. Therefore, formal education can be considered an indirect driver of environmental degradation and a contributor to the loss of biocultural heritage (Poole 2015; Poole et al. 2013; Bridgewater and Rotherham 2019).

Ricardo Rozzi (2013) has described the confluent loss of the rich interrelation of biological, cultural, and linguistic diversity as *biocultural homogenization*. Ignoring the erosion of cultural heritage and ecological knowledge as an indirect driver of biocultural homogenization can lead to further degradation of biodiversity and traditional ways of life. Ultimately, this could result in further collective loss and

depreciation of biocultural heritage, thus hindering efforts within sustainable development.

Biocultural heritage as a concept reflects the diverse ways of being between human communities and their local environments, including their rich history of language, heritage, cultural memory, ecological knowledge, and values and therefore should be explicitly articulated as a key component to any sustainability agenda (Poole 2018). Consequently, I and others continue to propose that to accomplish any inclusive policy or institutional space for environmental learning and sustainability agenda, it is indispensable to include capacities to address biocultural heritage. Therefore we must acknowledge biocultural heritage in our formal institutions and policies (Poole 2018; Rozzi 2013; Gavin et al. 2015; Cocks 2006). Regarding a biocultural approach for addressing EoE, it is essential to acknowledge multiple dimensions about the complexity of losses of biological and cultural diversity (Poole 2015). This requires multiple viewpoints from both the dominant and marginalized groups (Agrawal 1995; Maffi 2005).

## 15.4 Theoretical Implications: Limitations and Problems of Formal Education

Since the identification of the concept of EoE by Pyle as an ongoing process, the term first communicated a sense of disconnection and alienation from nature (Pyle 1978). This loss results from the absence of not only the knowledge about the natural world, but additionally, of fundamental opportunities for experience. Further, this alienation can be expressed in forms of discomfort, or disgust, as illustrated by urban schoolchildren who have disdain for rural ways of life or consider packaged foods more palatable than unprocessed ones (Poole 2015). These experiences provide the foundation for that knowledge to be useful for everyday life and to take hold as a fundamental aspect of the individual's life experience.

For these reasons, by addressing EoE, I highlight both the experience that is lost and the drivers or conditions that create this extinction (Poole 2015). As global society is coping with the environmental crisis, it is necessary to address it pluralistically, including distinct perspectives across the rural-urban gradient. Future policies must incorporate a biocultural viewpoint in education, as well as technologies, policies, and societal structure to prevent the EoE cycle. I also argue the biocultural framing has greater sensitivity to the nuanced relationship between culture and place, its multi-generational heritage, and the great time that is required to develop understanding of ecosystem management by local communities (Poole 2015; Maffi 2005; Nabhan and St. Antoine 1993; Miller 2005).

By marking the loss of this biocultural understanding with the concept of EoE, we can explicitly create a conceptual placeholder for this knowledge and where it should be present within education, policy, and practice. By identifying its importance, even when it is lacking in practice, we simultaneously address its invisibility while

creating the space to work on the recovery of these more sustainable ways of thinking and practices in the instances they have been lost (Poole 2018). To summarize the theoretical implications of these findings then, we can make the following observations:

The extinction of experience cycle can be understood as occurring when there is loss of:

- (a) Knowledge of local species
- (b) Experience with local species
- (c) Or, awareness of these losses

That the EoE cycle self-perpetuates by varying degrees when tied to educational institutions that formalize practices which:

- (a) Decouple cultural knowledge, local languages, and inter-generational knowledge from each other
- (b) Embed elements of biocultural homogenization

Conceptualizing EoE as a critical placeholder for biocultural losses reminds us to look at the interrelated dynamics of the structured world around us and the ways formal education, industrial agriculture, and the global economy influence our imagination and capacity to engage the world according to our ecological conscience. Nonetheless more research is needed, and the importance of this concept is increasingly being recognized (Gaston and Soga 2020).

Indeed, the capacity to understand the complexity of ecological systems is also necessary to avoid an idealization of the moral complexity of nature in that all of nature is not ideal or beautiful. The emphasis upon “recreational care” or “utilitarian care” of nature are not the only values that are lost through EoE, nor are they the only tools that can be used to draw public attention to the ecological importance and innate value of nature. Indeed, these are values of nature and should be acknowledged, but other ways of relating, valuing, and engaging persist as well (Kellert 1997). The emphasis on the need to develop an ethic of care in response to the loss of nature experience can undermine the significance of biodiversity loss and its causes to the concerns of the individual’s quality of life obscures our attention to the causes that produce systematic loss of biodiversity and alternative cultural ways of life.

We must therefore integrate the discussion of EoE within sustainability discourse throughout the urban fabric—reminding ourselves that every “vacant” lot is really an urban wildland, and in turn, every structure built, and the experiences these spaces create has the potential to drive our global society towards or away from the flourishing of biocultural diversity and engaging biocultural heritage(s). In particular, focusing our discussion on revisions of education, specifically environmental education, will require careful reflection on the elements that engage meaningful experiences with our communities, environments, learning spaces, and the content that is taught at schools. To reverse EoE, education must become a space in which we can engage biocultural heritage to reinforce and support sustainable interconnections between diverse human societies and their distinct environments.

## 15.5 Mitigating the EoE Cycle: Envisioning Formal Education as a Driver of Biocultural Heritage

The chapter has introduced the extinction of experience cycle and the potential that education has to serve either as an indirect driver of EoE or as driver of biocultural conservation. The biocultural critique is often expressed in terms of proposed alternative management practices and institutionalized policies that alter the human–nature relationship and the capacity for local communities to express and utilize their local and traditional ecological knowledge. As we engage formal education to address consumer and urban communities, these educational contexts must also engage biocultural framings that situate for this new sense of place and consider context and complex colonial and linguistic histories.

The deep connection of culture with ecological place is often obscured by the dominance of cultural views that do not recognize this co-constitutive connection. I propose that extinction of experience can also be understood as the absence of the knowledge of interconnection between culture and nature, and that in the absence of a cultural heritage that is able to articulate such losses, sensitivity to this interrelation can become lost, and never known by generations. That is, for communities that lack a strong intellectual, linguistic, or ecological tradition related to the land, it can be difficult to conceive of what this knowledge might be to a people who have such a tradition. Further, this knowledge is often treated within formal education in global society as less valuable than techno-scientific knowledge and placed lower on the “hierarchy of knowledges” about the world. A biocultural framing of EoE will aid in understanding the ongoing drivers and impacts of heritage, language, and biodiversity losses in the long term by affirming a view of reality that is invisible to many within formal education.

A biocultural framing of EoE aids in understanding the ongoing drivers and impacts of heritage, language, and biodiversity losses in the long term by affirming a view of reality that is invisible to many within formal education. Just as we need to consider biocultural heritage within our policies and sustainable development goals, we must find spaces to acknowledge this type of learning and way of thinking, and ethical engagement within our formal educational models as well. This can be transformative as we revisit our educational policies, but also as we engage learning in our informal learning pathways as well, our media, online and virtual environments as well.

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