

# ENVIRONMENTAL LEADERSHIP FOR ADDRESSING COMPLEX SOCIO-ECOLOGICAL CHALLENGES

4

Socio-ecological decisions are those made by individuals, communities, organizations, and institutions that are informed by and impact the natural world. These decisions are affected by relationships between humans and the natural world, what is called “nature-culture relations”.<sup>1</sup> Nature-culture relations often vary by culture, context, and society, and affect which socio-ecological decisions are made and enacted. Understanding the connections between humans and the natural world is imperative for creating and sustaining socially and environmentally just decisions.

This brief synthesizes promising research from psychology and environmental governance. We examine how nature-culture relations inform individual and collective decisions about socio-ecological issues, such as natural resource management and community relationships with land. While there is a great deal of research on adult and organization decision making, research on child socio-ecological decision making is sparse. This research gap impacts our understanding of how to shape learning environments that reflect 21st century demands, and how to engage youth in decisions that impact their lives and the lives of their families and communities. Therefore, this brief highlights the existing research, as well as potential next steps for educators to support healthy socio-ecological decision making as a core component of science education.

## NATURE-CULTURE RELATIONS IN SOCIO-ECOLOGICAL DECISION MAKING FOR INDIVIDUALS AND COMMUNITIES

There is a robust branch of research on learning that focuses on how all human activity, including environmental decision-making, are part of complex webs of social and environmental relationships. These relationships span across people, communities, places, and artifacts<sup>8</sup> and are grounded in experiences and practices which form *mental models*. Mental models suggest that how one thinks about the natural world is tied to one’s *relationship* with it, and thus affects how one acts or makes *decisions* in it (nature-culture relations).<sup>9</sup>

For example, cross-cultural research on Indigenous and non-Indigenous populations has demonstrated differences in nature-culture relations beginning at a young age and manifest in differences in land management and sustainability practices. In a series of studies, Atran and Medin<sup>10</sup> reported that even cultural groups living in the same region may have widely different

**SOCIO-ECOLOGICAL SYSTEMS** refer to the complex interactions between human and ecological systems, and should be considered together when learning and making decisions<sup>1-2</sup> An example: climate mitigation strategies.



Local youth restoration project in a watershed.

conceptualizations of the natural world, *as well as* different behaviors and relationships with the environment. This is relevant to understand why some communities engage in “environmental degradation” or in healthy ecological living or management. For many Indigenous communities in North and Central America, these differences include recognizing that humans are *part of*, rather than *apart from*, the natural world, and more-than-humans are deserving of respect, reciprocity, and humility.<sup>1,10-13</sup> In turn, this informs socio-ecological decision-making that is sustainable and engenders principles of being with the natural world instead of *for* or *about* the natural world.<sup>14</sup>

**SOCIO-ECOLOGICAL DECISIONS** are those made by individuals, communities, organizations, and institutions that impact the natural world; they are value-laden, politically-charged, and emotionally salient.<sup>2-3</sup>

**COMPLEX SYSTEMS** are nonlinear, self-governing, decentralized interactions among parts of a system that lead to collective behavior that is greater than the sum of its parts.<sup>4-6</sup> Understanding complex phenomena requires reasoning across spatial and temporal scales, and sometimes attending to “invisible” relationships.<sup>4</sup>

## EXAMPLES OF CULTURALLY DISTINCT LAND MANAGEMENT PRACTICES

Consider these examples of land-management practices from cross-cultural research. How do they reflect different nature-culture relations?

**Fishing:** In a series of studies, Menominee and Euro-American fishers in Wisconsin, U.S. were asked about their knowledge of fish and fishing and their fishing practices. While both groups had similar knowledge around fish and fishing, they made different decisions about fishing practices and sustainability.<sup>11</sup> Euro-

American fishers engaged in catch-and-release methods of fishing in order to preserve young and protected fish while Menominee fishers only caught what they would use, following an ethic of “do not waste.”<sup>11,15</sup>

**Hunting:** Similarly, Menominee and Euro-American hunters were asked about deer hunting knowledge and practice.<sup>15</sup> Euro-American hunters in this study sought to preserve deer populations by only hunting adult bucks. Menominee hunters sought to preserve “carrying-capacity” of the land – or what the ecosystem can handle – and hunted to preserve this. This resulted in more ecologically healthy populations of deer on Menominee reservation land than off of the reservation.

**Agro-Forestry:** In a study with the Santa Cruz Mayans in Quintana Roo, Mexico, foresters were asked about their agro-forestry practices. The Santa Cruz Mayans in this study practiced slash-and-burn and swidden agriculture as well as harvested for timber and non-timber forest products.<sup>16</sup> Because the Santa Cruz Mayans viewed the ecological health of the land as pertinent to their own survival and themselves as an integral part of the ecology of the land, they organized to create effective policies and institutions to help regulate the extractive practices that were occurring on the land. Practicing for over a century, the forest cover only decreased slightly; in fact, it decreased less in the Santa Cruz Mayan lands than in other protected areas of Mexico where humans are not allowed to live.<sup>16</sup>

**Socio-Ecological Impact:** All humans impact the natural world in a variety of ways. Through these examples, we can see that individual and collective decisions about the natural world reflect nature-culture relations.

Healthy ecological systems absorb shock and stress, self organize, learn, adapt, and are defined by the amount biodiversity they are able to support; therefore, healthy socio-ecological systems should also do the same.<sup>2</sup> This means cultivating forms of decision making

## CASE STUDY

In a project working with conflicting views around artisanal fishing and conservation in Tenerife off the coast of Spain, Romero Manrique de Lara & Corral<sup>21</sup> used a community-based research process to co-produce knowledge with community members in order to identify problems, brainstorm solutions, come to a consensus regarding how to move forward and suggest policy changes. Their participatory

process was beneficial in that it built agency, incorporated traditional and Indigenous knowledges, and helped to alleviate stagnating conflict between stakeholders through “reducing the gap between policy makers and local community and widening the interaction between stakeholders to allow a more certain application of policies in the medium and long term.”<sup>21 p 161</sup>

premised in diversity, learning, and critical awareness of history and power.<sup>1,17</sup>

## INCREASING DIVERSITY OF THOUGHT AND EXPERIENCE

Seeking innovative solutions for rapidly changing local, national, and transnational environmental issues requires bringing together diverse ways of knowing (for example, local/traditional, Indigenous, and Western scientific knowledges).<sup>17-18</sup> However, simply bringing diverse knowledges to the table does not guarantee equitable participation in the decision making process, nor in its implementation. Often, this is due to inherent power relationships that drive whose ideas are deemed valid and get taken up. The dehumanization of peoples enacted through slavery, forced removal and relocation, and assimilation tactics, as well as the objectification of lands and waters as resources solely for human consumption underlie the continued exclusion of Minoritized and Indigenous peoples from true decision making. Future research can and should consider processes of partnering that critically examine not only underlying mental models and nature-culture relations of stakeholder groups<sup>19-20</sup> but should also seek to redistribute power and center local, traditional, and Indigenous knowledges and peoples in decision making capacities.

## CULTIVATING LEARNING & ADAPTATION TO SUPPORT SOCIO-ECOLOGICAL DECISIONS

Studying and making decisions regarding socio-ecological systems requires expanding on local/traditional, Indigenous, and Western scientific knowledges as well as the co-production of new knowledges. Rapidly changing climates and ecosystems as well as the technological capacity to gather new forms of data require us to rethink current data-informed decision making processes. Thus, we need new forms of rapid learning cycles that include young people, families, communities, and practitioners who can collect, analyze, and make critical decisions regarding the health and wellbeing of local socio-ecological systems. There is now a wealth of studies demonstrating the effectiveness and innovation created by local communities in maintaining the resilience and health of species and ecosystems;<sup>17</sup> however, there is little research that specifically focuses on children and youth. This is a detriment if we hope to sustain intergenerational transmission of local, traditional, and Indigenous knowledges and if we hope to develop pathways and identities for young people to contribute to meaningful community participation and collective continuance.<sup>22</sup>

Thus, we call for future research and practice that offer

**MENTAL MODELS** are the cognitive frameworks that people use to interpret and understand the world. Shaped by social, cultural, environmental, and experiential factors, mental models incorporate deeply ingrained and often unquestioned assumptions that impact behavior and decision making.<sup>7</sup>

**NATURE-CULTURE RELATIONS** refer to relationships between humans and the natural world that are informed by place, times, artifacts, and ways of knowing. These vary across culture and impact cognition, development, social organization, decision making.<sup>1</sup>

opportunities for young children and youth to engage in complex systems reasoning and thinking and to make decisions that connect their familial and community lives with the natural world. Additionally, we call for forms of learning that affirms young people's identity as scientists and change-makers, and that are culturally rooted and supportive of the local/traditional, or Indigenous knowledges practiced and transmitted in their daily lives. Finally, we ask for learning that takes seriously the interconnected of humans and more-than-humans and facilitates relationships of care, respect, and reciprocity.

## CONSIDERATIONS FOR PRACTITIONERS & FAMILIES

Below are set of considerations for families and educators in formal and informal environments to encourage youth to make health socio-ecological decisions:

- Teach children that humans are animals and therefore part of nature. One way to do this is to help children see that all living kinds play a role in nature, including humans, and that no one role is superior to another.
- Help children appreciate nature and more-than-humans through providing the opportunities to experience being outdoors in parks, nature reserves, gardens, etc.
- Engage in volunteer opportunities as a family or class to help our natural world, like picking up garbage, starting a recycling and compost regimen in your home or school, growing your own food, plantings trees with a local organization, etc.
- These actions can help foster the notion that humans are animals who have a beneficial role to play in the natural world.

## REFERENCES

- <sup>1</sup> Bang, M., & Marin, A. (2015). Nature–culture constructs in science learning: Human/non-human agency and intentionality. *Journal of Research in Science Teaching*, 52(4), 530–544.
- <sup>2</sup> Berkes, F., (2017) Environmental governance for the anthropocene? Socio-ecological systems, resilience, and collaborative learning. *Sustainability* 9(1232), 1-12.
- <sup>3</sup> Newell, B. R., McDonald, R. I., Brewer, M., & Hayes, B. K. (2014). The psychology of environmental decisions. *Annual review of environmental resources*, 39, 443–467. doi: 10.1146/annurev-enviro-010713-094623
- <sup>4</sup> Grotzer T, Tutwiler MS. Simplifying causal complexity: how interactions between modes of causal induction and information availability lead to heuristic driven reasoning. *Mind Brain Ed.* 2012(8): 97–114.
- <sup>5</sup> Hmelo-Silver CE, Pfeffer MG. Comparing expert and novice understanding of a complex system from the perspective of structures, behaviors, and functions. *Cog Sci.* 2004;28(1):127-138.
- <sup>6</sup> Levy ST, Wilensky U. Inventing a “mid level” to make ends meet: Reasoning between the levels of complexity. *Cog Instruct.* 2008;26(1):1-47.
- <sup>7</sup> Biggs D, Abel N, Knight AT, Leitch A, Langston A, Ban NC. The implementation crisis in conservation planning: Could “mental models” help? *Conserv Letters.* 2011;4(3):169-183.
- <sup>8</sup> Bang M. Culture, learning, and development and the natural world: The influences of situative perspectives. *Ed Psych.* 2015;50(3):220-233.
- <sup>9</sup> Medin DL, Bang M. The cultural side of science communication. *Proceed Natl Acad Sci.* 2014.
- <sup>10</sup> Atran, S. and Medin, D. (2008). *The Native Mind and the Cultural Construction of Nature*. Cambridge: The MIT Press.
- <sup>11</sup> Medin DL, Ross N, Cox D, Atran S. Why folkbiology matters: Resource conflict despite shared goals and knowledge. *Human Ecol.* 2007;35(3):315-329.
- <sup>12</sup> Kawagley AO. A Yupiaq world view: Implications for cultural, educational, and technological adaptation in a contemporary world. Doctoral dissertation: University of British Columbia; 1993.
- <sup>13</sup> Kawagley AO. A Yupiaq worldview: A pathway to ecology and spirit. Long Grove (IL): Waveland Press; 2006.
- <sup>14</sup> Shotter, J. (2006). Understanding process from within: An argument for ‘witness’-thinking. *Org Stud* 2006;27(4):585-604.
- <sup>15</sup> Ross N, Medin D, Cox D. Epistemological models and culture conflict: Menominee and Euro-American hunters in Wisconsin. *Ethos.* 2007;35(4):478-515.
- <sup>16</sup> Bray DB, Ellis EA, Armijo-Canto N, Beck CT. The institutional drivers of sustainable landscapes: A case study of the ‘Mayan Zone’ in Quintana Roo, Mexico. *Land Use Pol.* 2004;21(4):333-346.
- <sup>17</sup> Tengö M, Brondizio ES, Elmqvist T, Malmer P, Spierenburg M. Connecting diverse knowledge systems for enhanced ecosystem governance: The multiple evidence base approach. *AMBIO.* 2014;43(5):579–591. <https://doi.org/10.1007/s13280-014-0501-3>
- <sup>18</sup> Olsson P, Folke C. Local ecological knowledge and institutional dynamics for ecosystem management: A study of Lake Racken Watershed, Sweden. *Ecosys.* 2001;4(2):85–104. <https://doi.org/10.1007/s100210000061>
- <sup>19</sup> Gregory R. Using stakeholder values to make smarter environmental decisions. *Env: Sci Pol Sust Dev.* 2000;42(5):34-44.
- <sup>20</sup> Gregory R. Incorporating value trade-offs into community-based environmental risk decisions. *Environ Val.* 2002;11(4):461-488.
- <sup>21</sup> Romero Manrique de Lara D, Corral S. Local community-based approach for sustainable management of artisanal fisheries on small islands. *Ocean Coast Manag.* 2017;142(C):150–162. <https://doi.org/10.1016/j.ocecoaman.2017.03.031>
- <sup>22</sup> Whyte KP. Justice forward: Tribes, climate adaptation and responsibility. *Clim Change.* 2013; 120(3):517-530.



Northwestern  
University

