3. Handout: Considering Culturally Responsive and Sustaining Science (Biology) Instruction for Indigenous Students

Traditional Native knowledge of the biological world emphasizes ecological relationships, focusing on interconnections among species, such as how species and environmental features in a habitat depend on one another. When teaching about the biological world, start with highlighting how species within an ecosystem rely on and influence one another. Incorporate the Native perspective that people are a part of nature rather than separate from it.

Historically, most science education begins with the study of "model species," which exhibit the most salient characteristics of living beings. The curriculum then gradually builds toward an ecological orientation. This learning pathway does not account for Native students' "habits of mind," nor does it leverage their existing biological knowledge. Additionally, when ecosystems are taught, humans are rarely included, reflecting a specific cultural belief system that is inconsistent with traditional Native perspectives.

In a study comparing biological science knowledge between members of the Menominee tribe and a nearby rural, non-Native community in Wisconsin, the authors found that even the youngest children in the Menominee community (ages 4–6) demonstrated the ability to use ecological reasoning—reasoning in terms of ecological relationships (Bang, Medin, & Atran, 2007).

The study provides an example of ecological reasoning in which a child might justify an influence from bees to bears because a bee could sting a bear, or reason that a bear might acquire an attribute from a bee by eating its honey. Among non-Native children, only the oldest demonstrated ecological reasoning. Many of the non-Native children in the study also didn't recognize shared traits between animals and humans if the traits were introduced first in animals. This asymmetrical reasoning was based on the idea that "people are not animals." In contrast, Menominee children generalized across species, including humans, in a symmetrical fashion. They recognized that humans share many traits with animals to the same degree that animals share traits with humans.

In another study comparing children's books written by Native and non-Native authors, researchers found a pervasive ecological perspective in books written by Native authors (Medin & Bang, 2014). Researchers observed that non-Native authors tended to depict animals outside their natural habitats and behaving like humans—for example, wearing clothes and walking and talking like people. This finding aligns with non-Native children's belief that animals are like humans but not vice versa. In contrast, Native authors typically depicted animals in their natural habitats, behaving according to their species, reflecting an ecological worldview. This study highlights the importance of including stories and other books written and illustrated by Indigenous authors in science lessons.

References

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